



## **About Us**

ACES Fuel Injection specializes in developing and manufacturing state-of-the-art performance-engine management systems and ignition components geared toward do-it-yourself automotive enthusiasts. Our company was founded on an electromechanical engineering background, and our talented staff always keeps a grip on the newest technology available. We use our expertise to guarantee top-notch quality components and constant innovation of new products and services for car and truck enthusiasts around the world.

Our greatest advantage is the overall simplicity of our products. From a painless installation to real-time tuning in just hours, our fuel injection systems offer a great advantage over the competition. Our KILLSHOT™ Throttle Body EFI system features a built-in interface that allows users to have full control of the engine without the need of a PC. This allows you to install the system at home without the need of special tools or software. We also offer several other components to help seamlessly integrate our advanced technology into your vehicle.

Our craftsmanship and technology are built upon a foundation of extreme performance. With a history of producing winning results in a wide variety of applications, our pedigree offers proof of our commitment to attain the best results, wherever we compete. With more than 10 years of experience developing and designing high-performance products, ACES Fuel Injection has a product to fit your needs.

## **Mission**

Research, innovate, and develop real, efficient, quality solutions, making engine management technology the key factor of success, and bring pride and satisfaction to customers by integrating them into the ACES Fuel Injection Team.

## **Vision**

Become the world's leading company in engine management technology.

## **Values**

Ethics, commitment, professionalism, teamwork, quality, pioneering spirit, creativity, continuous innovation, pursuit of results and customer satisfaction.

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# KILLSHOT™ THROTTLE BODY EFI OVERVIEW

ACES EFI KILLSHOT™ Self-Tuning EFI system is the most advanced throttle body injection (TBI) system on the market. The KILLSHOT™ utilizes four 100 lb./hr. fuel injectors, giving the system the capability of supporting up to 650 horsepower. The system includes the throttle body (with integrated fuel injectors, TPS sensor, MAP sensor, IAT sensor, and stepper motors), wiring harness, Bosch O2 sensor, ECU, handheld programmer for easy tuning and monitoring of engine data.

ACES' KILLSHOT™ TBI system fits any 4150-flange 4-barrel intake manifold and is designed for easy installation and tuning. Installation is straightforward and easy, and the system includes everything you need to get on the road or track quickly. The calibration wizard and self-tuning features mean advanced tuning knowledge or experience is not required.

Whether you are building a budget beater or a boosted racing car, ACES EFI's KILLSHOT™ EFI kit has the technology and advanced features to you need, in an easy-to-install, easy-to-tune package so you can take your ride to the next level!

KILLSHOT™ includes:

- 4150 flange throttle body for easy carburetor replacement
- Four integrated 100 lb./hr. fuel injectors
- Integrated TPS, MAP, and IAT sensors
- System supports up to 650 horsepower
- Integrated ignition timing control and coil driver
- Advanced innovations make this system the most advanced TBI system
- Easy-to-install design, can easily be done by the average enthusiast
- Easy-to-use calibration wizard makes initial start-up simple and easy without the need for custom tuning
- Adaptive self-tuning strategy for idle control and fuel control
- High-quality Bosch 4.9 wideband sensor
- Dual electric fan control
- High-resolution 5-inch full color touchscreen handheld controller for initial setup, tuning, and gauge displays
- CAN communication for Handheld Controller-based calibration and display
- Available finishes: Black Ceramic

COMING SOON: Brushed Aluminum and Gold

ALSO COMING SOON: Master Kits including complete fuel system (20 ft of PTFE fuel hose, fuel pump, filters, necessary hardware, and bulkhead fitting for returning fuel to tank)

**Thank you for betting on ACES! We are proud to be your manufacturer of choice.**

## Parts List

Item	Description	QTY	Service Part
1	KILLSHOT™ ECU	1	AS2012
2	Handheld	1	AS2009
3	Throttle Body Assembly	1	AM1001
4	Main harness	1	AH2012
5	Wide band O <sub>2</sub> sensor	1	AE1060
6	Coolant Temperature Sensor	1	AE1052
7	Clamp-on Oxygen Sensor Bung	1	AE1061
8	Air Cleaner Gasket	1	
9	4150 Flange Gasket	1	
10	Breather Stud	1	
11	2" Grommet	1	

### ADVANCED USER CAPABILITIES

The ACES KILLSHOT™ EFI software does allow for advanced tuning functionality. A laptop is required to access the advance tuning functions. These functions are not recommended for enthusiasts without extensive EFI tuning knowledge and experience.

**NOTE: Making changes to the calibration in the advanced tuning functions can lead to catastrophic engine damage if not done correctly. ACES is not responsible for any damage caused due to advanced tuning errors.**

### WARNINGS, NOTES, AND NOTICES

**NOTE:** This system does not contain fuel system components including the fuel pump, fuel filters, fuel pressure regulator, and lines. ACES fuel injection offers complete kits which can be purchased separately (coming soon!).

**NOTE:** This system is designed for stock and mild cam, naturally aspirated, boosted, and nitrous oxide GM LS engines.

**WARNING!** The KILLSHOT™ TBI systems consist of several sophisticated components. The failure of any one component does not constitute, nor does it justify, warranty replacement of the complete system. Individual service items are available for replacement of components.

**WARNING!** To preserve the warranty, these instructions must be read and followed thoroughly and completely before and during installation. It is important that you become familiar with the parts and the installation of the KILLSHOT™ TBI system before you begin. Failure to read and understand these instructions could result in damage to KILLSHOT™ TBI components that are not covered by the warranty and could result in serious personal injury and property damage.

**WARNING!** The oxygen sensors in this kit are recommended for use with unleaded fuel ONLY. Use of leaded fuels will degrade the oxygen sensor and will result in incorrect exhaust gas oxygen readings and improper fuel delivery. Failure to follow these directions does not constitute the right to a warranty claim.

**WARNING!** Failure to follow these instructions will result in an improper installation, which may lead to personal injury, including death, and/or property damage. Improper installation and/or use of this or any ACES product will void all warranties.

**WARNING!** Use of some RTV silicone sealers will destroy the oxygen sensors used with this kit. Ensure the RTV silicone sealant you use is compatible with oxygen sensor vehicles. This information should be found on the RTV package.

**WARNING!** For the safety and protection of you and others, only a trained mechanic having adequate fuel system experience should perform the installation, adjustment, and repair. It is particularly important to remember one of the basic principles of safety: fuel vapors are heavier than air and tend to collect in low places where an explosive fuel/air mixture may be ignited by any spark or flame resulting in property damage, personal injury, and/or death. Extreme caution must be exercised to prevent spillage and thus eliminate the formation of such fuel vapors.

**WARNING!** This type of work **MUST** be performed in a well-ventilated area. Do not smoke or have an open flame present near gasoline vapors or an explosion may result.

**WARNING!** This installation is not for the tuning novice! Use this system with **EXTREME** caution! The ACES KILLSHOT™ EMS allows for total flexibility in engine tuning. Misuse or improper tuning of this product can destroy your engine! If you are not well versed in engine dynamics and the tuning of engine management systems **DO NOT** attempt the installation. Refer the installation to an ACES-trained tuning shop or call ACES for technical assistance.

**NOTE:** All supplied ACES FUEL INJECTION calibrations, wizards and other tuning information are offered as potential starting points only. **IT IS THE RESPONSIBILITY OF THE ENGINE TUNER TO ULTIMATELY CONFIRM IF THE CALIBRATION IS SAFE FOR ITS INTENDED USE.** ACES FUEL INJECTION holds no responsibility for any engine damage that results from the misuse or mistuning of this product!

# 1.0 Introduction and System Requirements

This manual has been written by ACES Fuel Injection for the installation of the EFI throttle body injection system. This basic manual contains the information necessary for the installation of the throttle body, wiring, and sensors. Please read all the WARNINGS and NOTES, as they contain valuable information that can save you time and money.

**WARNING!** Before disconnecting the battery, we recommend locating a clean switched 12-volt ignition source. This source needs to have 12 volts while cranking and with the key in the run position. Disconnect battery before proceeding with any work to the vehicle.

**NOTE:** An assistant is necessary for some installation and adjustment procedures and should be present for safety reasons.

## 1.1 Engine Requirements

Before the installation, please verify your vehicle meets the engine and fuel system requirements below:

- Engine is in sound mechanical condition
- Engine horsepower is between 200-650
- Engine is a 4-, 6-, or 8-cylinder
- Engine has a 4-barrel, 4150-style flange intake manifold
- Unleaded fuel only
- Any RTV silicone sealants used on the engine are sensor safe

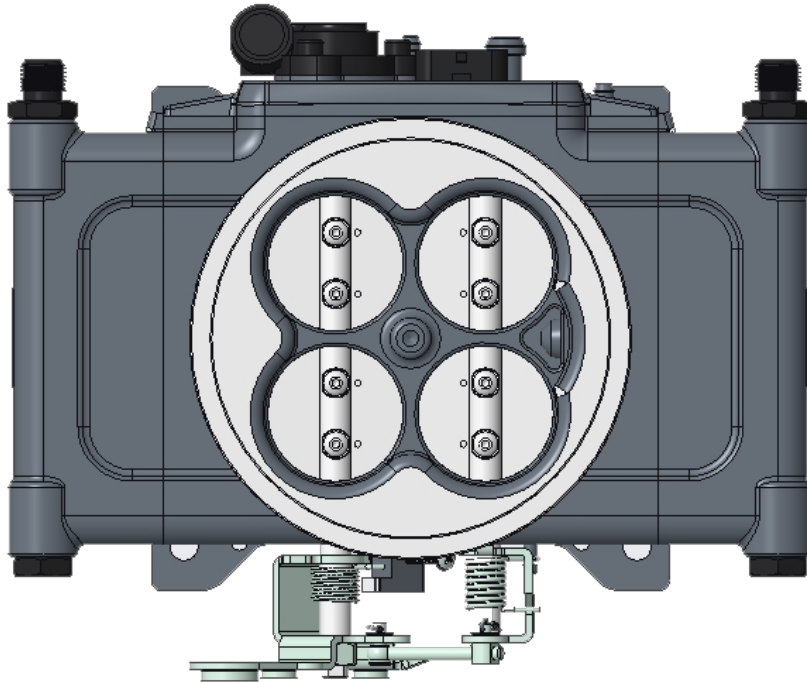
# 2.0 Installation

## 2.1 Throttle Body Installation

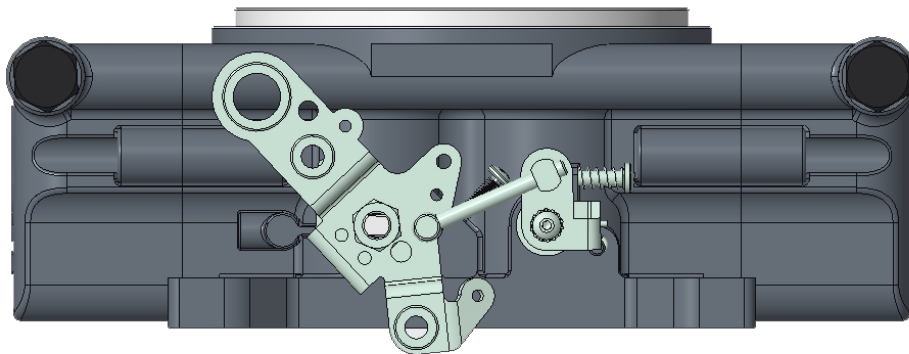
The throttle body has two connectors: one to control TPS and the other to control fuel injectors, IAC, and TMAP sensor.

The ACES throttle body design not only makes the throttle body structure clean and easy to install, but also the fuel injection controller is located externally. It is not affected by the high temperature and vibration of the engine, ensuring stability of performance.

**NOTE:** If you will be installing a new distributor, such as the ACES fuel injection BLACKJACK™ Pro Distributor, you may have more room to work if you complete the first part of that installation before bolting down the throttle body.

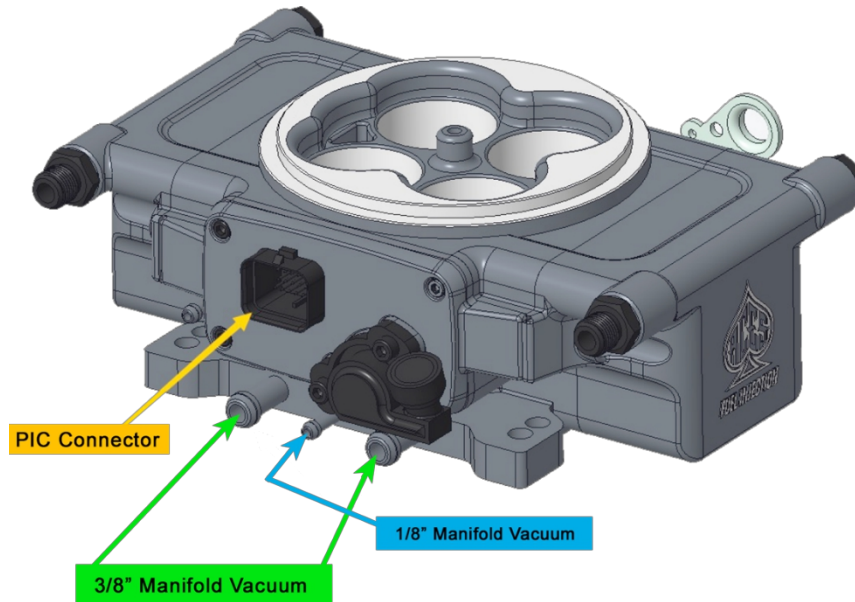


**Throttle Body Aerial View**



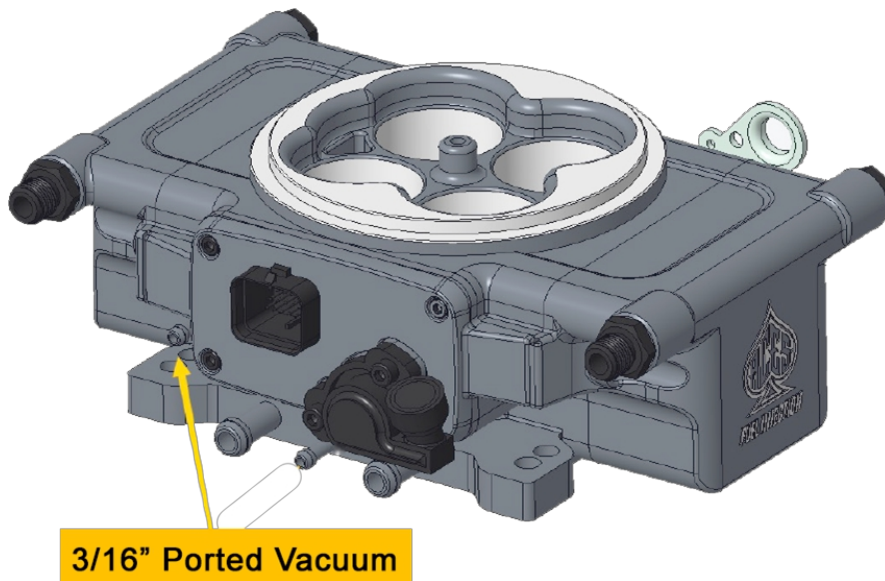
**Throttle Body Side View**

1) Begin by removing your carburetor. As you remove the carburetor, note which vacuum lines are running to ported or manifold vacuum. Determining if a vacuum port is “ported” or “manifold” vacuum varies on each carburetor; refer to the manufacturer’s specs for your specific carburetor.



NOTE: If you will have the carburetor removed for a length of time, be sure to plug your manifold with clean rags so that no foreign debris is allowed to enter the engine.

2) Install your new KILLSHOT™ throttle body using the provided gasket and fasten using the screws or studs that were used for your carburetor.

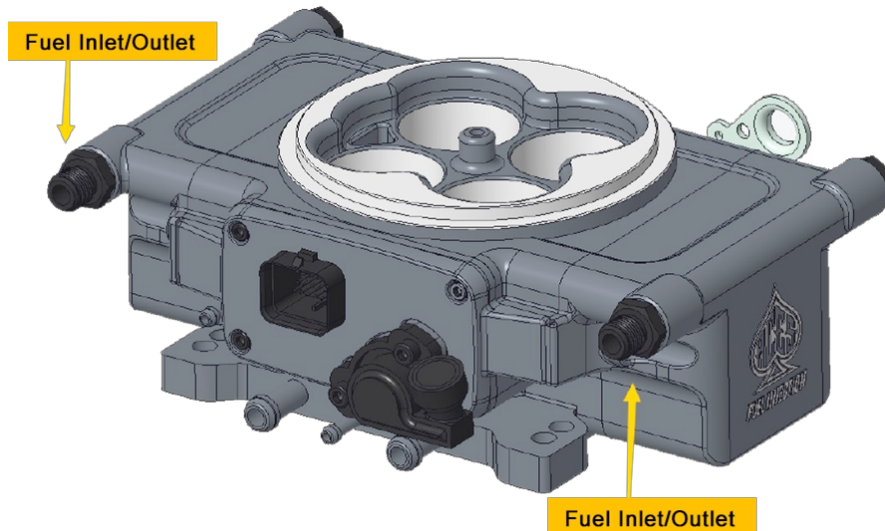


3) Reconnect all vacuum hoses, being sure to connect any ported vacuum systems to the correct 3/16" port as shown above. Leave any unused ports capped with the provided rubber caps.

4) When your entire installation is finished, be sure to install an air cleaner onto your throttle body.

## 2.2 Fuel System

A complete high pressure EFI fuel system must be installed for the KILLSHOT™ EFI system. The KILLSHOT™ EFI system requires a minimum of 43 PSI to operate, and it can be used with a return or returnless fuel system. When selecting a pump, regulator, and lines, be sure each component is designed to perform at high pressure. Coming soon, ACES Fuel Injection will offer Master Kits which include a fuel pump, hose, and accessories to complete your installation. The following are some guidelines to help set up a fuel system for your KILLSHOT™ EFI system as well as components available separately from ACES Fuel Injection. If using an in-line fuel pump, there should be a coarse pre-filter before the pump.



All systems should contain a 10-micron post-fuel filter after the fuel pump. An EFI-rated high-pressure, vacuum-referenced, bypass fuel pressure regulator is required.

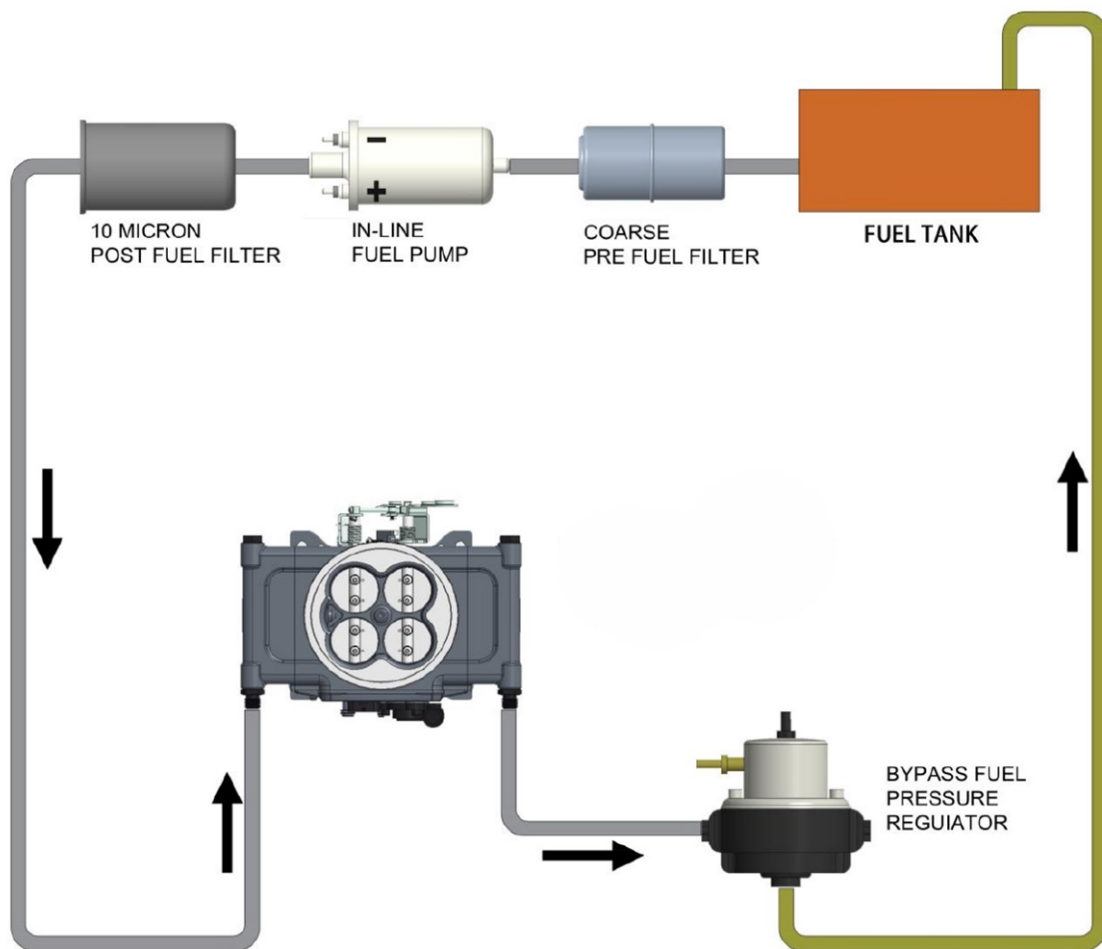
The fuel pump **MUST** be mounted lower than the lowest part of the fuel tank, and as close to the tank as possible. The fuel tank must also be properly vented.

- 1) Use the following diagram as a reference for the orientation and location of the fuel system components
- 2) Mount the electric fuel pump as close to the fuel tank outlet as possible with the bracket provided. Mounting the fuel pump in this manner will ensure that the pump will prime easily to ensure faster starts.
- 3) The pre-filter **MUST** be installed between the fuel tank and the fuel pump inlet. The purpose of this filter is to protect the fuel pump from particles of dirt or other foreign material. The filter should be installed with the arrow on the filter pointing in the direction of the fuel flow.
- 4) The post-fuel filter should be installed between the electric pump outlet and TBI unit and should be a 10-micron EFI filter. Position the filter so the fuel hoses can be routed without kinks or sharp bends. The filter should be installed with the arrow on the filter pointing in the direction of the fuel flow.

**WARNING!** Ensure both filters are installed in the proper direction. A flow direction arrow is printed on the side of the filter to indicate the direction of fuel flow. Failure to do so will result in a system malfunction.

Some late model vehicles that were originally equipped with a throttle body injection system may already have a return line to the fuel tank that can be utilized. The return line must not present a pressure restriction to the return fuel flow.

There should never be more than approximately 3 PSI of pressure in the return line. A line that is too small or has restrictions will cause tuning problems with the system.



**DANGER!** Do not use the vapor canister lines as a fuel return line. Possible fuel leaks may create a fire or explosion hazard, potentially causing serious injury or death.

**DANGER!** Proper installation of a fuel return line, if indicated, may necessitate complete removal of the fuel tank. This work should be done by a fuel tank specialist, who regularly does this work and is familiar with safety regulations and precautions necessary to do this work. If a person attempts this work, who is not familiar with the safety regulations and precautions, an explosion may result causing serious injury or death.

### 2.3 Oxygen Sensor Installation

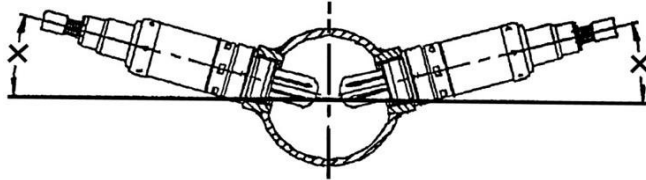
**IMPORTANT!** Position and support your vehicle on a suitable surface. USE CAUTION AND WORK ONLY ON A LEVEL SURFACE USING JACKS AND JACK STANDS OF SUFFICIENT CAPACITY TO LIFT AND SUPPORT YOUR VEHICLE. NEVER WORK UNDER A VEHICLE SUPPORTED BY A FLOOR OR BUMPER JACK. Use of a two-post underarm lift or four-post drive-on lift will considerably reduce the time and effort required to complete the installation. MAKE SURE LIFT LOCKS ARE ENGAGED BEFORE WORKING UNDER THE VEHICLE.

**WARNING!** Failure to disconnect the AIR pump and/or locating the oxygen sensor downstream from AIR injection will result in an extremely rich mixture, which could cause drivability problems and severe engine damage. If disconnecting



the AIR pump, check with local ordinances for the legality of this procedure in your area.

1) Locate a position for the oxygen sensor as close to the engine as possible. The oxygen sensor should be mounted at a point where it can read a good average of all the cylinders on one bank. This would be slightly after all the cylinders merge. If you have long tube headers, mount the sensor approximately 1-10" after the collector. You must have at least 18" of exhaust pipe after the sensor. If your vehicle has catalytic converters, the oxygen sensor MUST be located between the engine and the catalytic converters.



2) Ensure the sensor is located at the approximate angle shown above. This will help prevent condensation in the exhaust tubing from entering the sensor. The sensor can be mounted on either side of the tubing.

3) Drill a 7/8" hole in the intended location for the sensor. Weld an oxygen sensor weld ring into the 7/8" hole or use the clamp on bung system included. Weld all the way around the bung to insure a leak-proof connection. Allow the bung to cool completely, install the oxygen sensor into the weld ring, and tighten securely. It is a good idea to add anti-seize to the threads to aid in removal. Do not get any anti-seize on the tip of the sensor.

- \* The sensor should be installed in or after the collector. This gives the ECU an average reading across an entire bank instead of from just one cylinder.

- \* The sensor should not be mounted near the open end of the exhaust system. At low engine speeds, free air may reverberate into the exhaust and cause false readings.

- \* The system will not function properly if there are any exhaust leaks. Any fresh air that gets to the sensor will cause false lean readings. The ECU will respond by adding fuel that the engine does not need.

NOTE: Never run the engine with the oxygen sensor installed if it is not plugged in and powered by the ECU, or it will be damaged. If you need to plug the hole temporarily, use an O<sub>2</sub> sensor plug, or a spark plug with an 18mm thread.

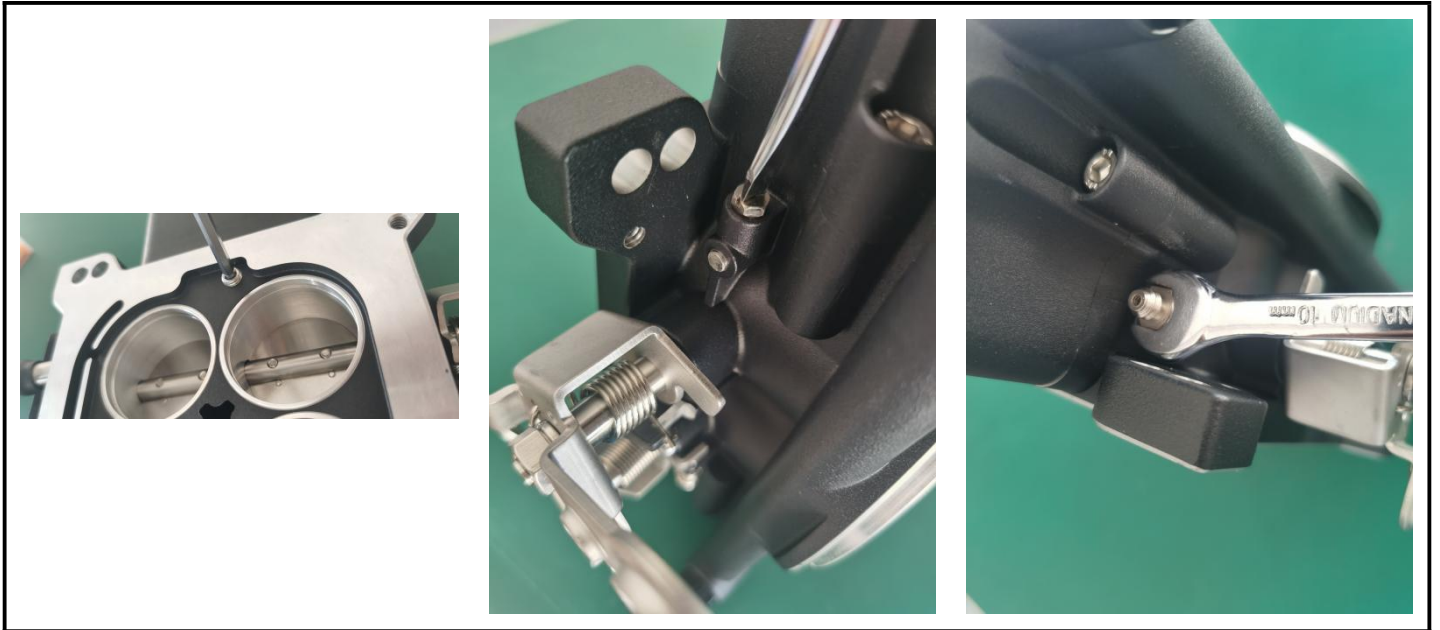
## 2.4 Coolant Temperature Sensor Installation

Install the coolant temperature sensor into a 3/8" NPT coolant passage in either the intake manifold or cylinder head. Do not overtighten or damage to the cylinder head or intake may occur. It is best to drain some of the coolant before the sensor is installed. Use thread sealer or a small amount of thread tape. Do not install the sensor in the thermostat housing, or in an area that will not see a constant flow of coolant.



**Coolant Temperature Sensor**

## 2.5 Boost Reference Port



- 1) Turn the throttle body upside down. Using a small drop of Loctite on the plug, install the plug into the threaded orifice next to the throttle blades.
- 2) Locate the boost reference port on the throttle body. It is located on the lower right corner of the throttle body on the same side as throttle cable linkage and remove the plug.
- 3) Install A 1/16 pipe to hose fitting into the boost reference port on the throttle body.

The boost reference port on the throttle body should be referenced below the supercharger directly off of the manifold or can be split off of the boost gauge reference line.

## 3.0 ECU Mounting and Wiring Overview

The KILLSHOT™ ECU can be mounted inside the passenger compartment (preferable location) or in the engine compartment. If mounted in the engine compartment, follow these guidelines:

- Mounting location should be as far from exhaust manifolds or headers as possible.
- Mount it as far away from spark plug wires, CD ignition boxes, or other “electrically noisy” devices as possible.

An EFI system depends heavily on being supplied a clean, constant voltage source. The grounds of an electrical system are just as important as the power side.

KILLSHOT™ ECU’s contain multiple processing devices that require clean power and ground sources. The wiring harnesses for them must be installed in such a manner that they are separated from “dirty” power and ground sources.

Keep sensor wiring away from high voltage or “noisy/dirty” components and wiring, especially secondary ignition wiring (plug wires), ignition boxes and associated wiring. It is best that the plug wires not physically contact any EFI wires.

NEVER run high voltage or “noisy/dirty” wires in parallel (bundle/loom together) with any EFI sensor wiring. If wires need to cross, try to do so at an angle.

The main power and ground source must be connected directly to the positive and negative battery terminals, not to any other place.

Properly crimp and solder any wire connections. Apply quality heat shrink over any of these connections.

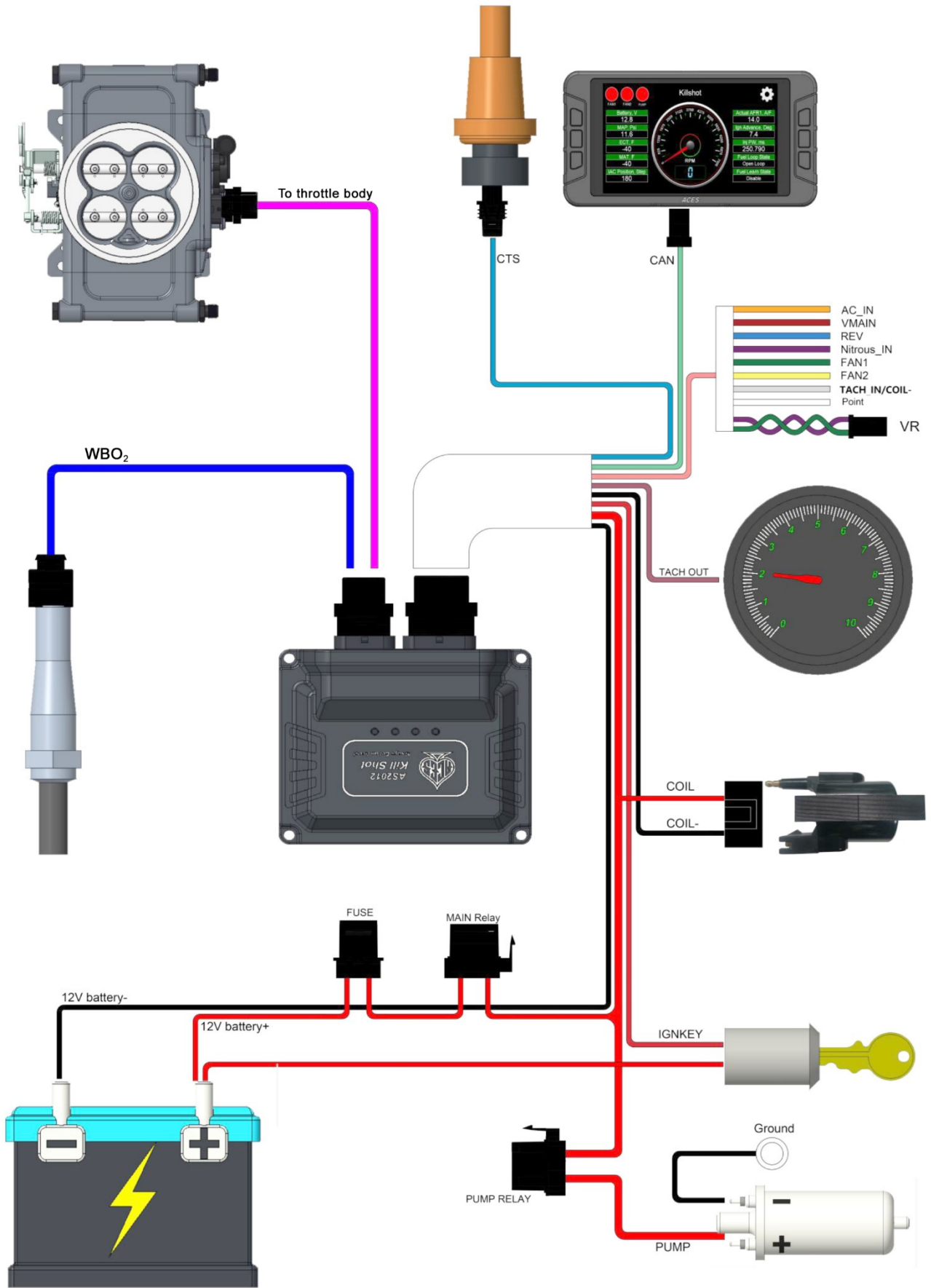
It is critical that the engine has a proper ground connection to the battery and chassis.

Do not use the electric fan outputs to directly power fans. They must only be used as a trigger source for a properly sized relay for the specific fan(s) used.

Don't use things like t-taps, etc. Use proper crimp connectors/solder and heat shrink.

It is never recommended to splice/share signal wires (such as TPS, etc.) between different electronic control units (i.e., “piggyback”).

### 3.1 ECU Wiring Overview



## 4.0 Wiring Installation

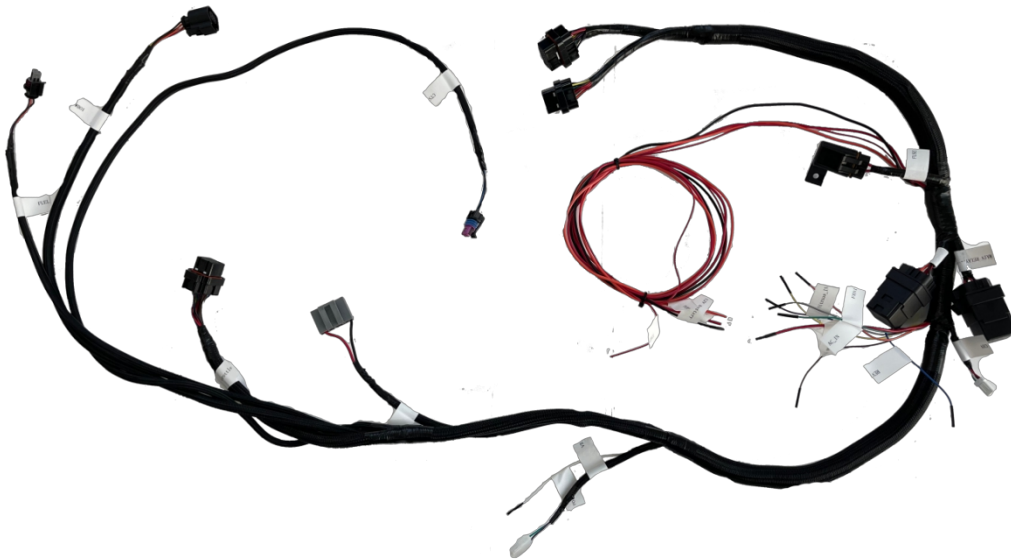
### 4.1 Harness Routing

If the ECU is mounted in the interior, the harness will have to be routed through the firewall into the engine compartment. Use a 2" hole saw to create a hole in a desired location if no other point of access is available and use the 2" grommet included to seal this area.

If the ECU is mounted in the engine compartment, the handheld tuning module cable will have to be routed to the "CAN" connector on the main harness (located near the ECU connector main connector). This is assuming you want to access the handheld module after startup. This will require routing the small CAN connector somewhere through the firewall.

Connect the PIA and PIB connectors of the main harness into the ECU.

About 22" from the ECU main connectors is a 40A relay. This powers the injectors and wideband O<sub>2</sub> sensor heating. There is also a fuel pump relay to control the fuel pump.



## 4.2 Sensor Connection

Connect the bulkhead, CTS, WBO<sub>2</sub>, CAN, and throttle body connectors (PIC) to their dedicated sensors/connectors in the diagram.

The throttle body connector (PIC) integrates the injectors, TMAP, TPS, and IAC wires. Plug this PIC connector into the corresponding connector on the throttle body.

Connect the distributor coil connectors (if using KILLSHOT™ ignition control).



**Throttle Body Connector (PIC)**

## 4.3 Ignition Coil (With Timing Control)

The KILLSHOT™ ECU integrates an ignition coil driver that uses a high performance IGBT chip. ACES recommends using ACES BLACKJACK Pro Series Ignition Coil (PN AC2008, in the chart on the next page) to get 90mj with 3ms dwell time spark energy without a CDI box. It is beneficial to cold start, maintaining idling stability and improved fuel economy.

**Connect coil connector to ignition coil AC2008 if you set harness connection and ECU configuration with timing control.**



**Ignition Coil Connector**

- Primary Resistance: 0.273Ω
- Primary Inductance: 2.63 MHz
- Secondary Resistance: 3.42 kΩ
- Secondary Inductance: 15.77 Hz
- Output (50pF load): 47 kV
- Output Energy: 150 mJ
- Peak Secondary Current: 100 mA +/- 7%
- Arc Duration: 200 μS
- Turns Ratio 78:1



**AC2008 BLACKJACK Pro Ignition Coil**

#### 4.4 Loose Wires

The following loose wires in the main wiring harness should be connected as follows on all systems.

**IGNSW (Red)** Should be connected to a clean key-on/cranking +12V power source. Power source should only be active when the ignition is on (key-on power). Make sure the source has power when the engine is cranking as well (check with voltmeter). Not all sources apply power when the ignition switch is in “cranking” position. This wire is located approximately 20” from the ECU connectors. DO NOT connect to a “DIRTY” source like an ignition coil!

**12V Battery + (Red)** MUST be connected directly to the positive battery terminal. This powers the fuel pump and fuel injectors. This wire is protected by a fuse in a sealed fuse holder. The fuse holder is located about 8” from the ECU connector. A 20-amp (20A) fuse is pre-installed.

**12V Battery - (Black)** MUST be connected directly to the negative battery terminal. Using a traditional chassis ground can cause electrical issues with the KILLSHOT™ ECU. This wire is located approximately 20” from the ECU connectors.

**Pump (Orange)** Used to activate a fuel pump (+12 volt). Do not use this wire to power fuel pumps that require over 15 Amps. Refer to your fuel pump manufacturer for amperage ratings. For high current pumps, use this wire to trigger a separate relay and use larger gauge wire to feed the pump; we recommend 10 gauge. The fuel pump also requires a ground wire. Run a wire from the negative side of the fuel pump. Connect it to a solid chassis/frame ground.

#### 4.5 Additional Wires

The following additional wire outputs in the main wiring harness should be connected as follows on all systems. These wires come out of the harness about 23” from the ECU connectors except **Point Out**.

**Tach Out (Orange)** This wire provides a 12V square-wave output and can be used to trigger a conventional tachometer.

**Tach\_In/Coil- (Grey)** A tach output from an ignition box or other source like coil-. This is the tach input for the ECU when it is not controlling ignition timing.

**Point Out (White)** Points output is used for controlling timing when using an ignition box.

**Fan1 (Purple)** This output provides a ground output to trigger a relay used for a cooling fan. This output should never be directly connected to a fan but the relay that powers the fan. This wire is located approximately 32" from the ECU connectors.

**Fan2 (Green)** This output provides a ground output to trigger a relay used for a second cooling fan. This output should never be directly connected to a fan but the relay that powers the fan. This wire is located approximately 32" from the ECU connectors.

**VMain (Red)** This output will provide a 12V power supply from the main relay. This wire is located approximately 32" from the ECU connectors.

**Nitrous\_In (Purple)** Nitrous oxide activation wire. Feeding 12V power to this wire tells the ECU that a nitrous oxide system has been activated.

**AC\_In (Orange)** This is a 12V input that recognizes that the AC has been activated.

**REV (Orange)** Optional - Programmable ground output

## 5.0 Handheld Controller

The Handheld Controller is used to create an initial calibration for the system, allows for simple tuning changes to be performed, and is also used to view various real-time EFI system data. We recommend that it be installed in the passenger compartment. The handheld plugs directly into the main harness at the connector labeled "CAN". This connector is located approximately 23" from the ECU connector. The handheld does not have to remain in the vehicle or be connected to the system once the vehicle is set up and running properly. (See Handheld controller section for more information)

## 6.0 Ignition Wiring - No Timing Control

In a "no timing control" state, the vehicle could be using an old mechanical points distributor or any number of more modern solutions for ignition on carbureted engines. In these instances, something else is driving the coil and determining when it should fire. The KILLSHOT™ ECU needs to know each time the coil fires. That will tell it engine RPM. If a CD ignition box is being used, KILLSHOT™ ECU will get its RPM signal from the ignition box's "tach" output. If a traditional, dwell-controlled inductive coil ignition system is being used (no CD ignition box), the KILLSHOT™ will get its RPM signal by going through the RPM Module to the negative side of the coil.



## 6.1 "Tach\_In/Coil-" Connection

### Option 1

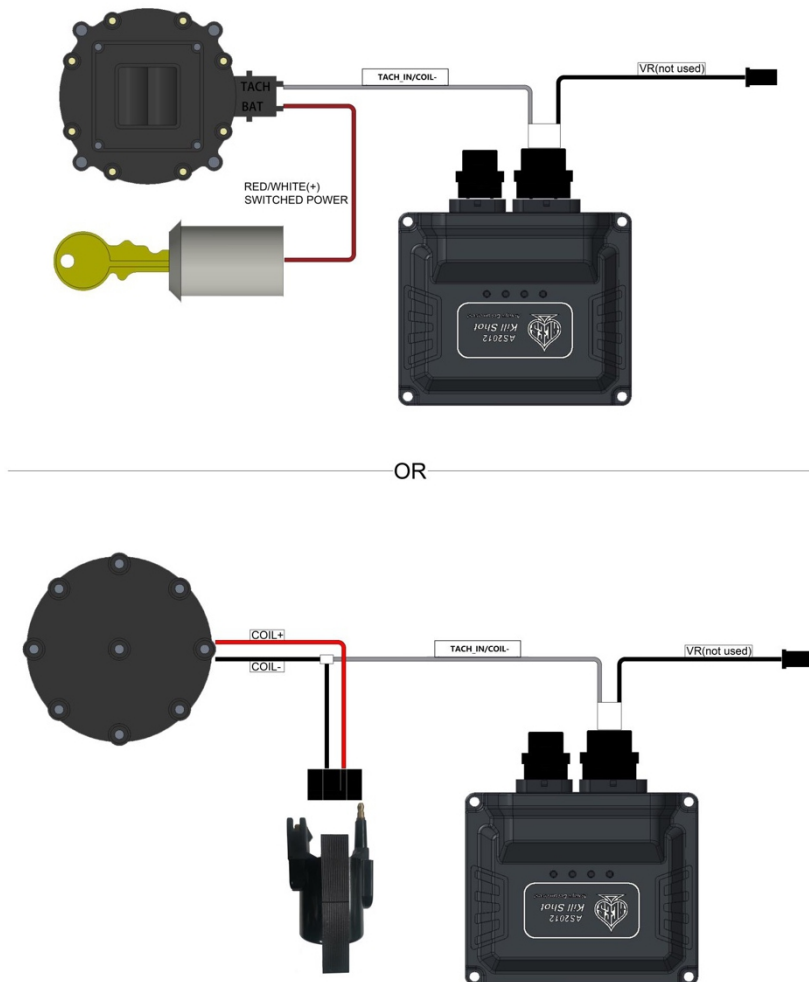
The "Tach\_In/Coil-" wire in the KILLSHOT™ harness gets its RPM signal from another module like a CDI box, ignition coil, etc. to the ECU.

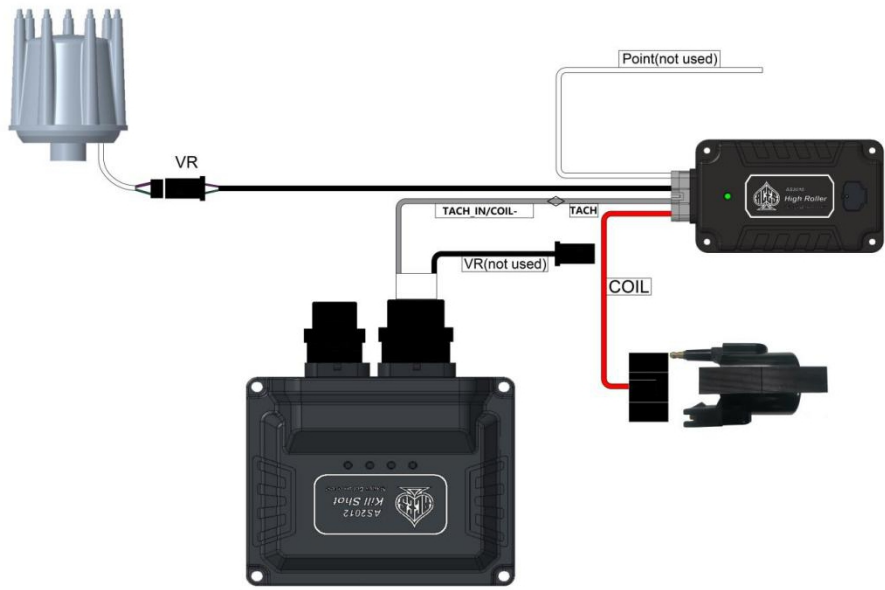
**NOTE:** When using this input, the EFI will NOT control the ignition timing of the engine. The timing will be based on the distributor initial, mechanical, and vacuum advance, just like it did with a carburetor.

### Option 2

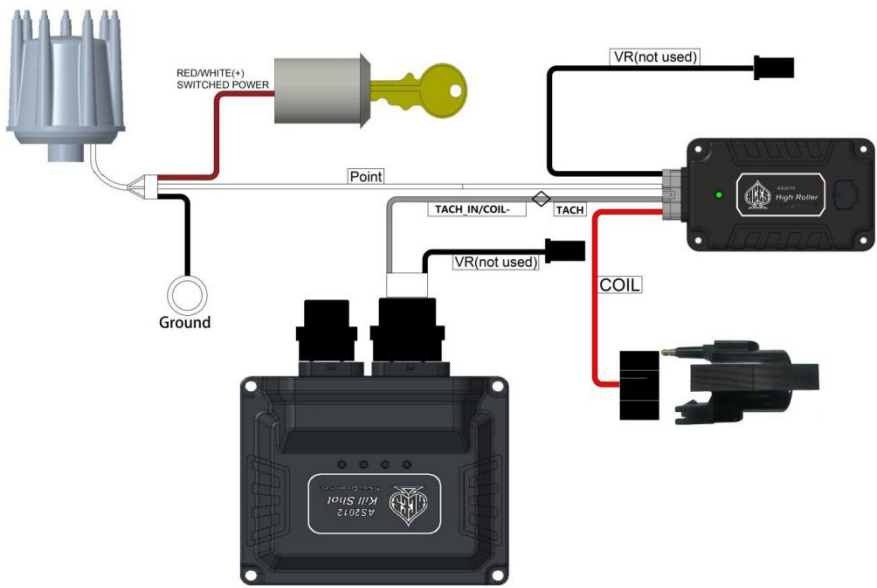
If you are using an aftermarket capacitive discharge (CD) ignition system such as an ACES HIGHROLLER™, MSD, or others, you need to connect to the "Tach Out" connection or wire these systems to the "Tach\_In/Coil-" wire of the KILLSHOT. This is a 12V square-wave signal.

**NOTE:** When using this input, the EFI will NOT control the ignition timing of the engine. The timing will be based on the distributor initial, mechanical, and vacuum advance, just like it did with a carburetor.





OR



## 7.0 Ignition Wiring - Timing Control

The KILLSHOT™ EFI can control timing using most common magnetic pickup distributors like ACES BLACKJACK series or MSD's. However, you may need to make several very simple changes to the distributor which are outlined in the following section. It is very important that you "lock out" the advance built into the distributor and install an adjustable rotor. Not "locking out" the distributor and installing an adjustable rotor as outlined in these instructions can cause the engine to run poorly or even cause engine damage.

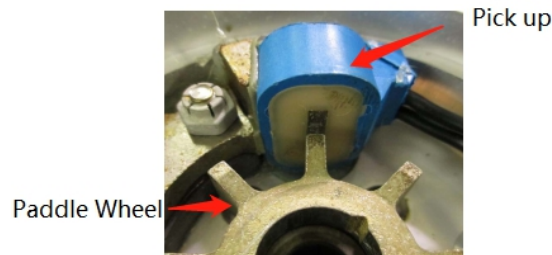
ACES recommends that those who wish to use the KILLSHOT™ timing control feature first get the engine to run without timing control. Splitting the timing control into a secondary process will add very little time to the total install, but could significantly help with trouble shooting, should it be needed.

The following is a list of items that are required to use the timing features of the KILLSHOT™ EFI system:

- An ACES Ignition control such as the HIGH ROLLER
- A locked-out distributor
- A timing light
- An adjustable rotor may be required to achieve accurate rotor phasing. For specific questions regarding your ignition components and integration with ACES products, please contact our technical services department.
- It is recommended but not required to use an ACES BLACKJACK Pro Series Billet Distributor with a 2-pin mag pickup connector.
- The balancer must be degreed. Mark on the balancer at 15 degrees before top dead center (BTDC).

Follow this procedure:

- 1) Start by locking out the centrifugal advance on your distributor. The distributor must be physically "locked out" so that the relationship between the pickup and the paddle wheel does not change with engine speed or load. Refer to the manufacturer's instructions for the proper procedure to lock out the centrifugal advance for your distributor. (This is a very important step; please do not skip.)
- 2) Once your distributor is locked out, position the engine at 15 degrees before top dead center (BTDC).
- 3) Insert your distributor into the engine but do not clamp it down yet.
- 4) Rotate the distributor body so that the pickup is aligned with the closest paddle on the paddle wheel. It is important for this paddle to be as centered as possible. (There will be an opportunity to check the alignment and compensate for any misalignment with the Handheld later in this installation procedure.)



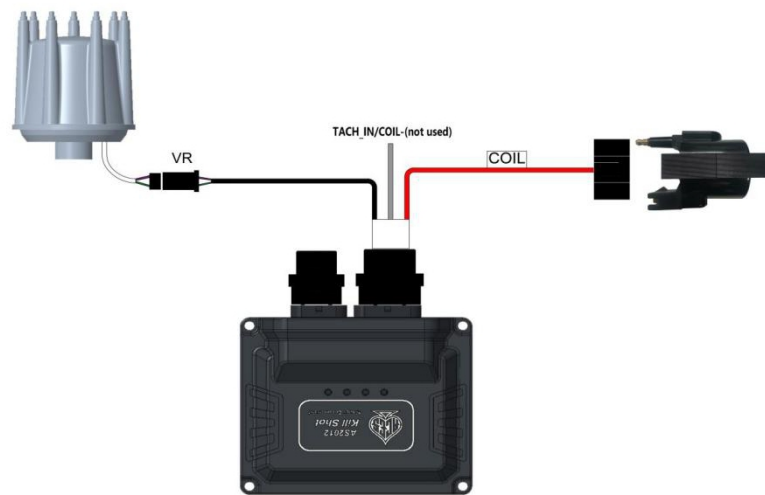
- 5) Clamp down the distributor.
- 6) It is important to phase the rotor to the cap. This will ensure that the rotor is in the correct position throughout the

timing sweep in order to fire to the correct cylinder terminal. If the rotor is not properly phased, then during operation, the rotor tip can sweep too far away from the correct terminal causing a weak spark or misfire and a lot of electrical noise. In order to correctly phase your distributor, you will need an adjustable phase rotor if you do not already have one.

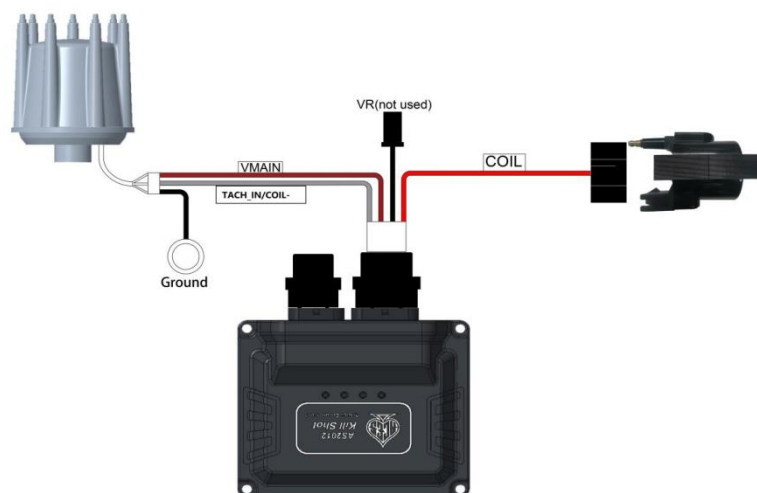
- 7) Install the adjustable phase rotor bottom and loosely install the rotor top.
- 8) Set the cap on the distributor and mark the middle of the #1 terminal on the distributor body.
- 9) Remove the cap and adjust the adjustable phase part of the rotor until the center of the rotor tip is lined up with the center of the mark you made. Then tighten the rotor adjuster screw and install the cap.

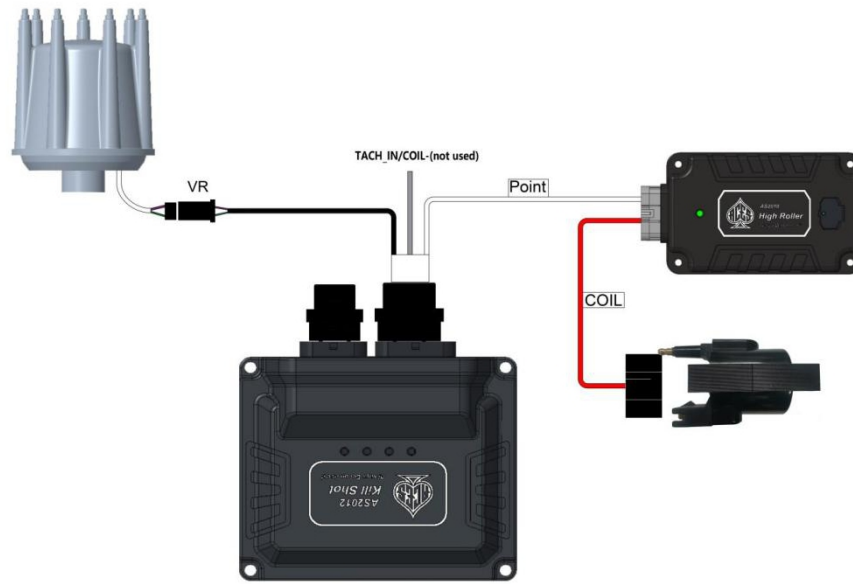
#### Option 1 - Direct Drive Coil

The KILLSHOT™ ECU integrates an ignition coil driver that uses a high performance IGBT chip. ACES recommends using AC2008 ACES BLACKJACK Pro Series Ignition Coil (in the chart on the next page) to get 90mj with 3ms dwell time spark energy without a CDI box. It is beneficial to cold start, maintaining idling stability and improved fuel economy.

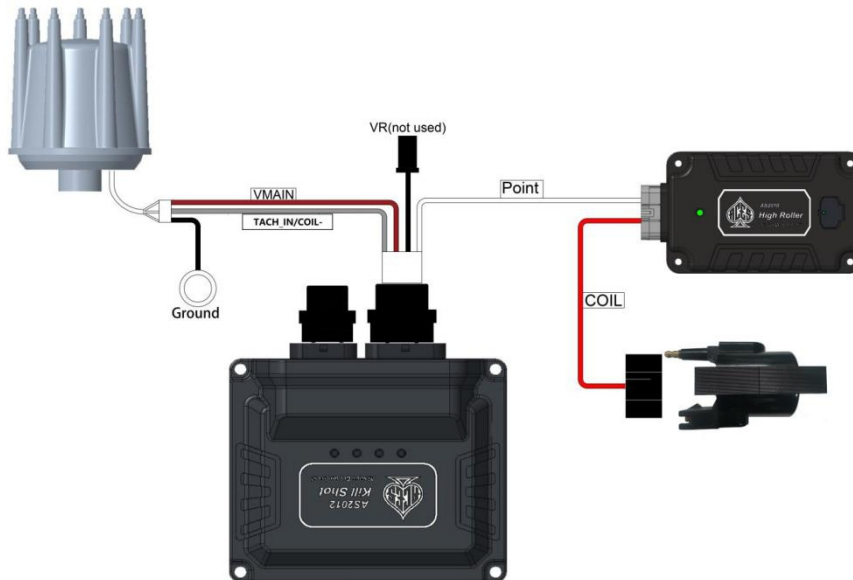


OR





OR

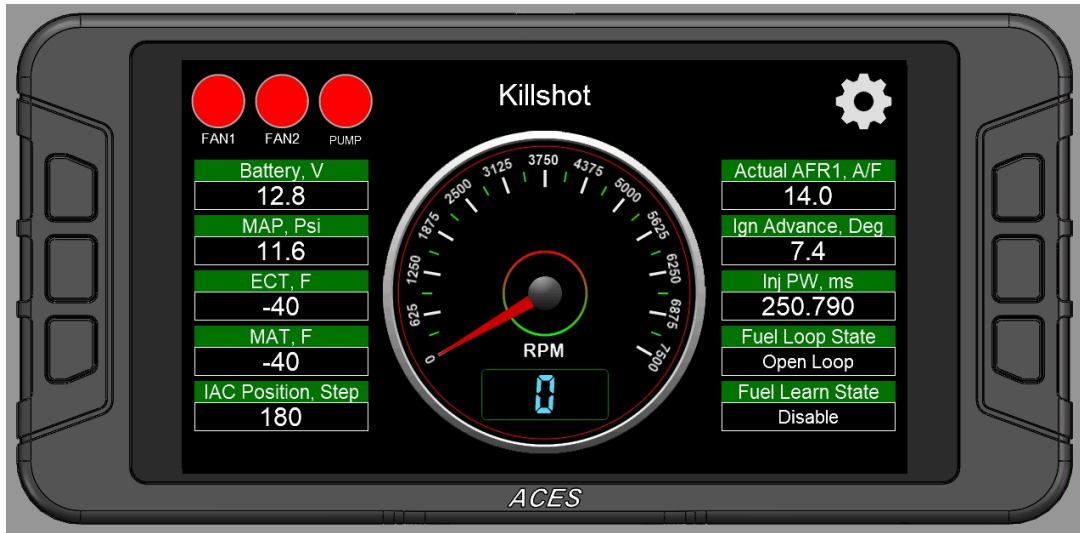


The loose wire “Point” provides an ignition signal from the KILLSHOT™ ECU to another module like the ACES HIGH ROLLER™ CDI box.

## 8.0 Handheld Controller Navigation and Use

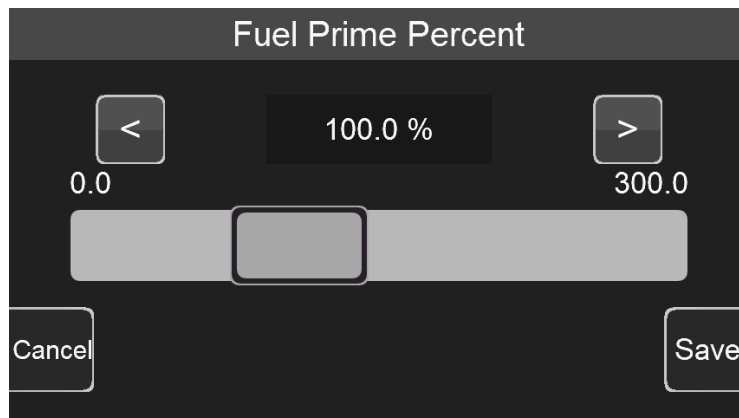
The Aces EFI KILLSHOT™ Handheld Programmer utilizes a 5” capacitive touchscreen and six manual buttons. The LCD screen has a large, vividly colored display. The Handheld uses CAN bus communication to the ECU and has a type-C USB interface for programming and other operations. All operations are done by touching the screen or the manual buttons.

The handheld can be used for monitoring and calibrating the system (for example: idle speeds, AFR targets, fuel pump, etc.) after connecting it with the ECU. It is portable and convenient for tuning at any time.

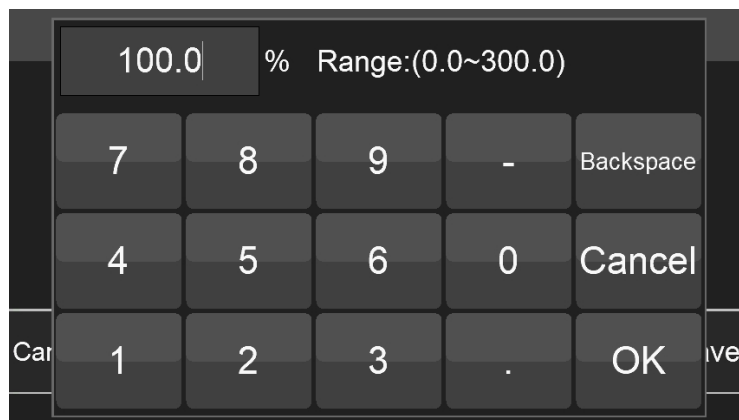


### 8.1 Making Adjustments

1) Slider Bar: Slide the bar or click "<" and ">" to adjust the parameters, click "Save" to save, and click "Cancel" to cancel.



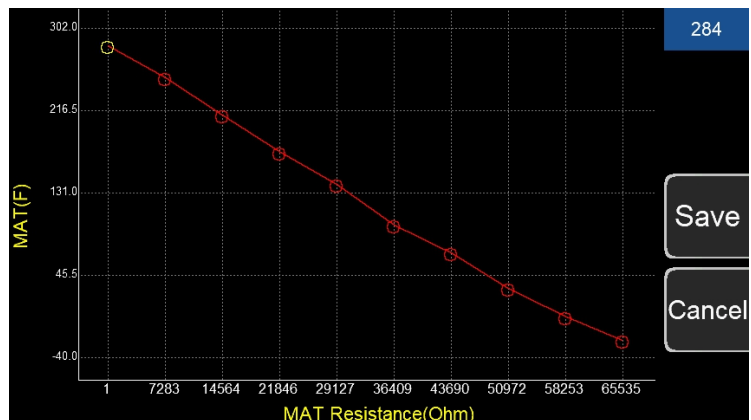
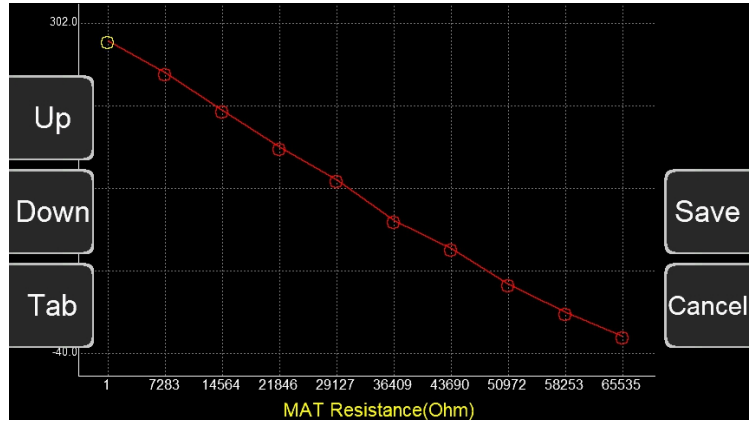
2) Numeric keyboard: Click the edit box "100.0%" above the sliding bar to pop up the numeric keyboard.



3) 2D Graph: Drag the red dot on the graph or click the mechanical button on the left to adjust the parameters. When adjusting the parameters, the upper right corner will display the Y-axis coordinate value of the currently adjusted

parameter. The three buttons on the left side of the interface will disappear after a short display. Click the mechanical button on the lower left corner to switch the position of the small yellow dot, click the middle button on the left to lower the yellow dot, and click the mechanical button in the upper left corner to raise the yellow dot. The Y-axis coordinate value of the yellow dot is displayed in the upper right corner of the interface.

After the configuration is complete, click "Save" to download the calibration data to the ECU; click "Cancel" to cancel the modification.

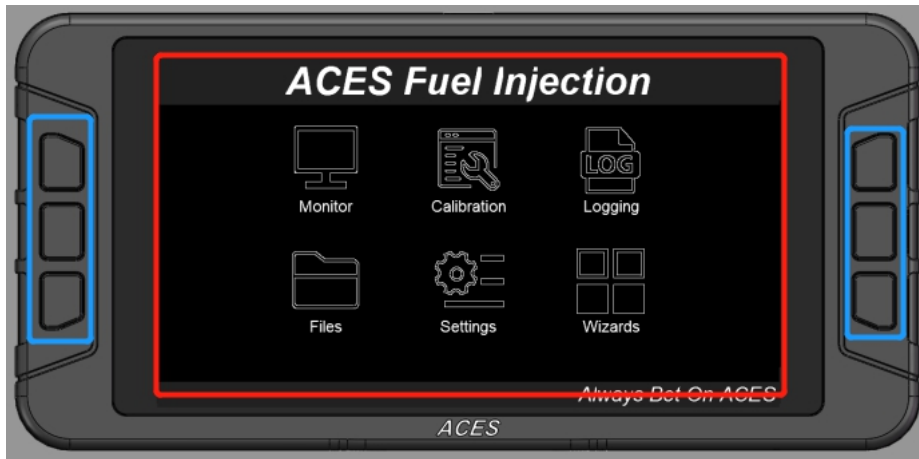


## 8.2 Connection

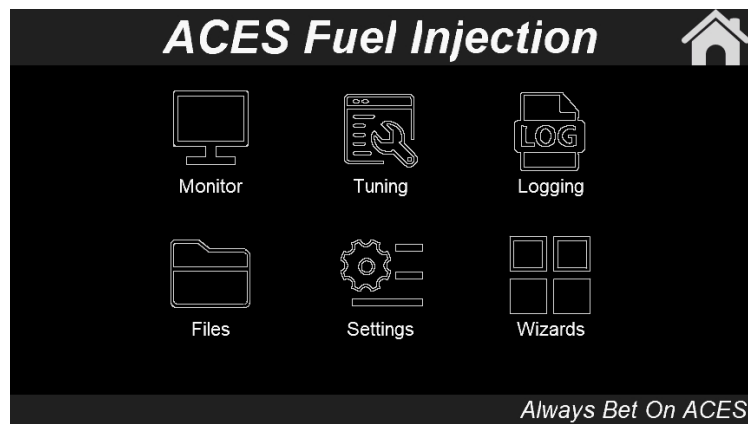
The handheld is connected to the ECU through the CAN bus. Program upgrading can be done through the type-C USB interface.

## 8.3 Navigation buttons

The ACES Handheld is designed for reliable operation and use. There are buttons on both sides of the display. The handheld is operated by touching the screen or the buttons on the sides. (See figure on the next page.)



## 8.4 Main Menu



The Main Menu has six (6) selections: Monitor, Tuning, Logging, Files, Settings, and Wizards.

**Monitor** - A variety of gauge and dash displays.

**Tuning** - Allows for various parameters to be easily adjusted.

**Logging** - Users can freely choose the monitored object to write to the log file in order to better observe the ECU data.

**Files** - Saves and loads tuning calibrations. Also shows information about the ECU and handheld controller.

**Settings** - Adjust the backlight brightness and volume for sound of buttons or touchscreen and see information about the handheld.

**Wizards** - Creates a base calibration and performs the TPS Zero Learn function.

The KILLSHOT™ EFI system will build a custom calibration for your engine based on a few easy to answer questions. To begin, Choose the Wizards icon from the main menu.

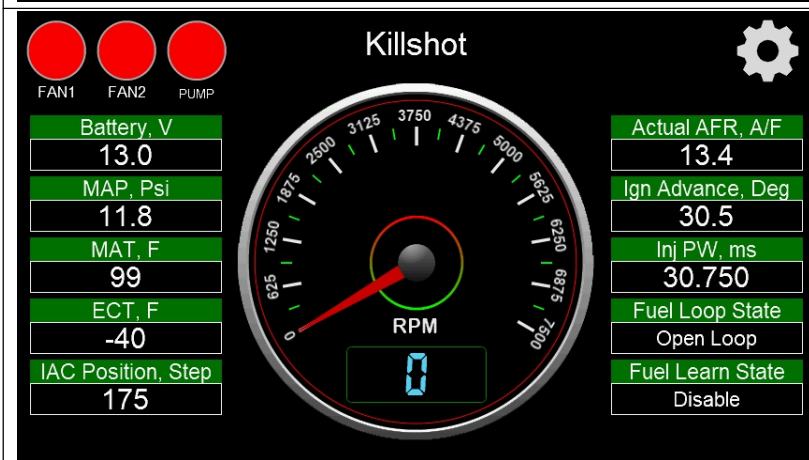


# 9.0 Calibration Wizard



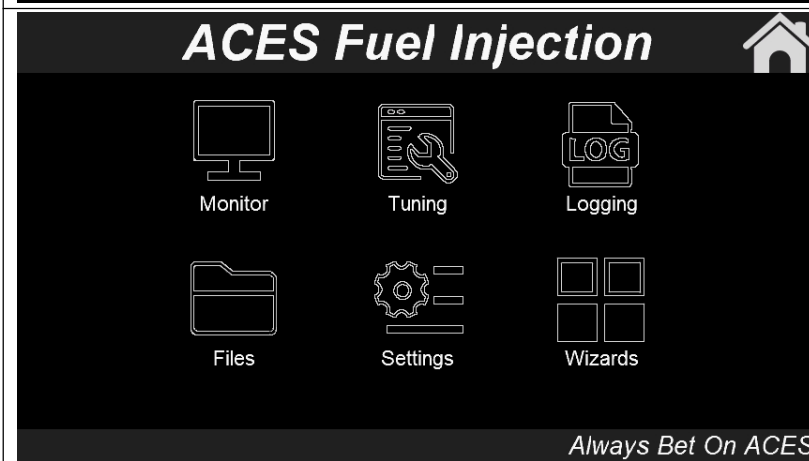
**Select System**

Connect the Handheld to the wire harness and Power up the ECU. Select KILLSHOT.





**Home Screen**

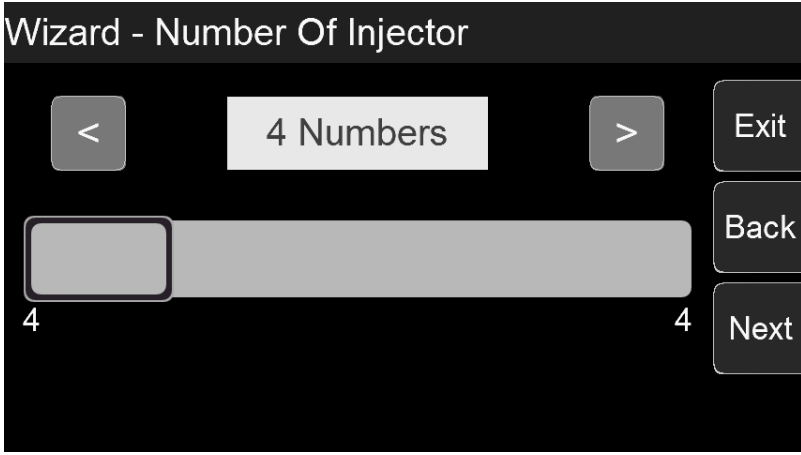
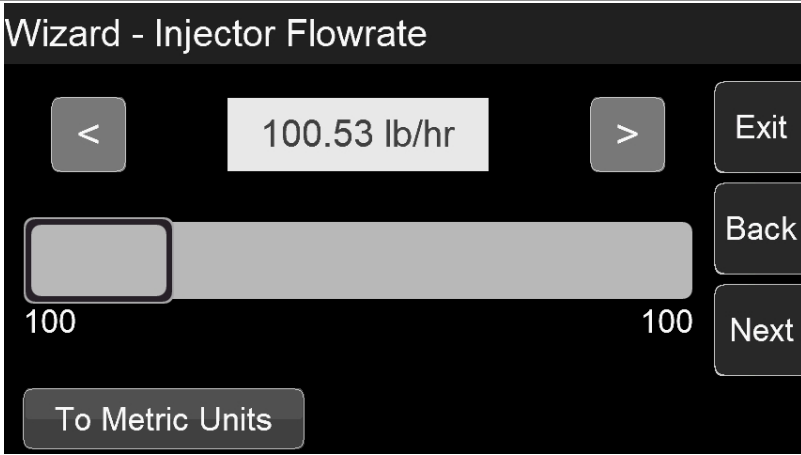
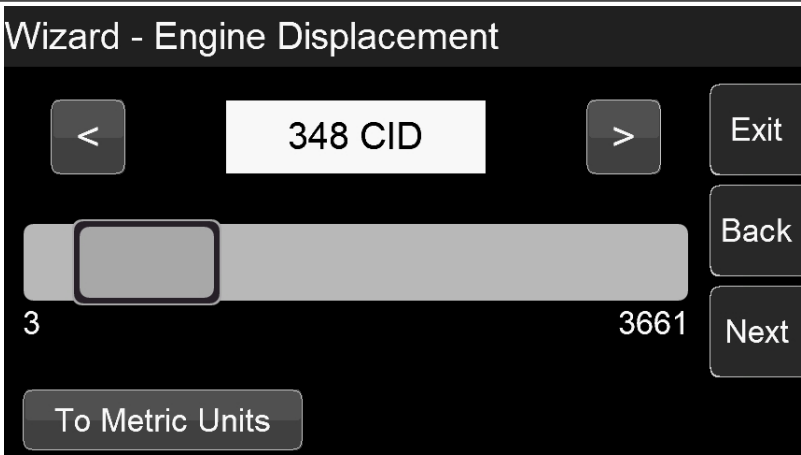
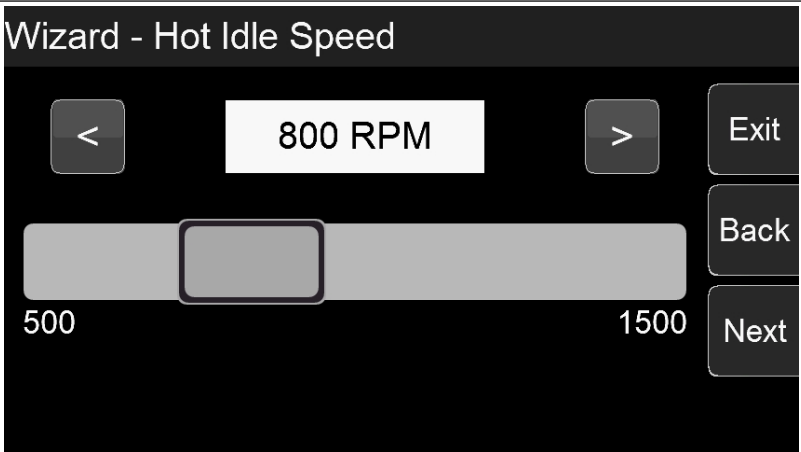
Click the "⚙️" icon in the upper right corner to enter the Main Menu.



**Main Menu**

Click Wizards from the main menu.

<p style="text-align: center;"><b>Wizards</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Start Wizard</p> </div> <div style="text-align: center;">  <p>TPS Autaset</p> </div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Back</div> </div>	<p style="text-align: center;"><b>Wizards</b></p> <p style="text-align: center;">Click Start Wizard to configure your KILLSHOT™ EFI system.</p>
<p><b>Wizard - Camshaft Type</b></p> <div style="display: flex;"> <div style="flex: 1;"> <p>Street/Strip</p> <p style="background-color: #ccc;">Stock/Mild</p> </div> <div style="flex: 0.2; display: flex; flex-direction: column; justify-content: space-around; align-items: center;"> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Exit</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Back</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Next</div> </div> </div>	<p style="text-align: center;"><b>Camshaft Type</b></p> <p style="text-align: center;">Select your camshaft type:</p> <ul style="list-style-type: none"> <li>• Stock/Mild = This selection will work well on most applications equipped with stock or “street performance” camshafts. Choose Stock/Mild If you are unsure of your camshaft specs.</li> <li>• Street/Strip = Select this if your engine has between 8” and 13” of manifold vacuum.</li> </ul> <p style="text-align: center;">Press Next.</p>
<p><b>Wizard - Dual WBOS</b></p> <div style="display: flex;"> <div style="flex: 1;"> <p style="background-color: #ccc;">Only WBOS1</p> <p>Dual WBOS</p> </div> <div style="flex: 0.2; display: flex; flex-direction: column; justify-content: space-around; align-items: center;"> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Exit</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Back</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Next</div> </div> </div>	<p style="text-align: center;"><b>Dual WBOS</b></p> <p style="text-align: center;">Select Only WBOS1 for your KILLSHOT.</p> <p style="text-align: center;">Press Next.</p>
<p><b>Wizard - RPM To Killshot/Ign Type</b></p> <div style="display: flex;"> <div style="flex: 1;"> <p style="background-color: #ccc;">Magnetic</p> <p>Coil (-)</p> <p>CD Ignition Box</p> </div> <div style="flex: 0.2; display: flex; flex-direction: column; justify-content: space-around; align-items: center;"> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Exit</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Back</div> <div style="border: 1px solid gray; padding: 5px; background-color: #ccc;">Next</div> </div> </div>	<p style="text-align: center;"><b>RPM To KILLSHOT/Ignition Type</b></p> <p style="text-align: center;">Select your ignition type:</p> <ul style="list-style-type: none"> <li>• Magnetic (ECU-Controlled Timing) <ul style="list-style-type: none"> <li>• Coil (-) (no timing control)</li> </ul> </li> <li>• CD Ignition Box (no timing control)</li> </ul> <p style="text-align: center;">Press Next.</p>

<p>Wizard - Number Of Injector</p> 	<p><b>Number of Injectors</b></p> <p>Select 4 injectors for your KILLSHOT.</p> <p>Press Next.</p>
<p>Wizard - Injector Flowrate</p> 	<p><b>Injector Flowrate</b></p> <p>The injectors of the KILLSHOT™ throttle body are 100 lb./hr.</p> <p>Press Next.</p>
<p>Wizard - Engine Displacement</p> 	<p><b>Engine Displacement</b></p> <p>Use the slider bar to set your engine displacement.</p> <p>Press Next.</p>
<p>Wizard - Hot Idle Speed</p> 	<p><b>Hot Idle Speed</b></p> <p>Use the slider bar to set your hot idle speed. This is the target RPM that will be enabled at coolant temperatures above 160 °F.</p> <p>Press Next.</p>

<b>Wizard - details</b>	
1. Camshaft Type---Stock/Mild	
2. Dual WBOS---Only WBOS1	
3. RPM To Killshot/Ign Type---Magnetic	
4. Number Of Injector---4 Numbers	
5. Injector Flowrate---100.53 lb/hr	
6. Engine Displacement---348 CID	

Click "Save" to save the configuration to the ECU. Click "Back" to return to the wizard to modify configuration. Or click "Home" to return to the main menu.

## 10.0 Sensor Verification

Before starting the vehicle, verify that all the sensors are reading properly. Turn the key off and cycle it back on. At this time, you should hear the fuel pump come on and run for 5 seconds. Check for fuel leaks.

On the Home Screen, with the key on and the engine off, these sensors should read as follows:

- **Engine RPM** – Will show “0.” (Will show RPM once the engine is cranking or running)
- **MAP** (Manifold Air Pressure Sensor) – Should read from 95-102kpa. At high elevations, it could read as low as 75kpa.
- **TPS** (Throttle Position Sensor) – Slowly depress the throttle to wide open. It should read 90-100 at wide open. Cable-operated throttle bodies should read 0 closed.
- **CTS** (Coolant Temperature Sensor) – Reads engine temperature. If the engine is “cold,” it should read close to ambient temperature.
- **Battery** – Reads battery voltage. Should be 12.0 volts minimum.

If ANY of these sensors is not reading properly DO NOT attempt to start the engine.

## 11.0 Startup Engine

At this point, you're ready to start the engine. Before attempting to start your vehicle with a newly installed KILLSHOT™ EFI system, ACES recommends running through the following checklist to help ensure a safe and successful start:

- 1) Double-check all wiring, especially:
  - a) Power and Ground are run directly to the battery.
  - b) The small Red “IGNSW” wire from the KILLSHOT™ ECU has power during both Key-On and Cranking.
- 2) The KILLSHOT™ ECU, fuel pump, fuel lines, and wires are securely mounted away from heat sources and pinch points.
- 3) Wide Band Oxygen Sensor is installed in a proper location.

- 4) There are no exhaust leaks.
- 5) Throttle linkage is complete and operational from the pedal.
- 6) Handheld powers up during Key On.
  - a) Each step of the Initial Setup in the Handheld has been done.
- 7) At Key On the fuel pump primes.
- 8) There are no fuel leaks when the system is under pressure.
- 9) Wiring connection is for No Timing Control (unless using timing features, ACES recommends starting up your engine with no timing control at first start).

When ready to start the engine, watch for Engine RPM on the Handheld Dash to know that the KILLSHOT™ ECU is getting proper input RPM signal.

Crank the engine and look at the RPM parameter. It should indicate RPM. The engine should fire and run and come to an idle. Cold engines will have high RPM, around 1200-1500, depending on engine temperature.

If you do not get an RPM signal, there is an error in the wiring or system setup. Call ACES Fuel Injection service at (423) 590-ACES for advice.

## 12.0 After Startup

Once the vehicle has started, look for any fuel or coolant leaks. Let the vehicle warm up while you check the following to make sure everything is operating properly:

- **Fuel Loop State** – Indicates whether the engine is “Closed Loop” or “Open Loop”. Closed Loop indicates that the ECU is adding or subtracting fuel to maintain the target air/fuel ratio. The KILLSHOT™ calibrations are such that the system should be operating closed loop almost all the time.
- **Inj Percent** – This is the percentage compensation of fuel that the ECU is adding or subtracting to maintain the target air/fuel ratio at any specific moment. A value less than 100% indicates the ECU is removing fuel. A value more than 100% indicates the ECU is adding fuel. When in open loop operation, this will always stay at 100%.
- **Inj PW** – Indicates the injector pulse width. This will vary depending on the engine speed and load.
- **Target Air/Fuel Ratio** – This is the target AFR (air/fuel ratio) the ECU is trying to maintain. This will vary depending on the engine speed and load.
- **Actual AFR** – This will show the air/fuel ratio that the wideband oxygen sensor is reading. The Closed Loop Compensation should be adding or subtracting fuel all the time such that the AFR value should always be close to the Target AFR.
- **Fuel Learn State** – This indicates the state of the KILLSHOT™ “Self-Tuning” operation (Learn Status). The system will automatically tune itself as you drive around. There are several conditions that must met for self-tuning to occur. The engine temperature must exceed 160° F, the system must be operating in a closed-loop mode, and self-tuning must be enabled. The base KILLSHOT™ setup has self-tuning enabled. Once the engine reaches 160° F, self-tuning should be active.

## 13.0 Timing Verification

### 13.1 No Timing Control

With a timing light, verify that the timing is set to an appropriate value for your engine. Adjust as necessary. It is critical to have the timing set correctly before the car has been driven with the KILLSHOT™ EFI. Many drivability and idle issues can be avoided with a properly timed engine.

### 13.2 Timing Control

Have a timing light handy as the first step will be positioning the distributor.

- 1) Switch the ignition key ON to power the KILLSHOT™ system up and go to Handheld **Tuning >>Spark>>Basic >> Static Timing**. This screen allows you to set the distributor exactly where the KILLSHOT™ ECU needs it to be positioned to operate the timing.
- 2) Start the engine. Then, set the static timing to 15 degrees BTDC. Then go to Handheld **Tuning>>Spark>>Advanced>>Lock Ignition Timing**. Click **Enter** to select **Lock**. Then save. Now, ignition timing is locked at 15 degrees BTDC. Using the timing light, rotate the distributor until you see 15 degrees BTDC on the balancer. Then tighten the hold down clamp.
- 3) Set **Lock Ignition Timing** to “unlock.” Set static timing to 15 degrees BTDC. Go back to the Home Screen, and the KILLSHOT™ ECU will now be controlling the ignition timing. Advancing or retarding ignition timing can make an engine want to speed up or slow down. KILLSHOT™ can use this principal as another way (in addition to the idle motor) to maintain the desired idle speed. Besides giving the ECU additional influence on engine speed, the idle timing adjust feature can also react very quickly with what we call “fast adjust” which utilizes timing control by advancing or retarding ignition timing. Conversely, “slow adjust” utilizes the IAC. The KILLSHOT™ ECU has two strategies of idle control. It is important to note that you will not see accurate timing at idle speed when viewing with a timing light. This is due to ECU calculations. If you rev the engine off idle, the timing will appear correctly.
- 4) Go to the Spark screen, **Tuning >>Spark>>Basic**. Here, you can adjust the idle, cruise, WOT, and cranking timing settings. It is HIGHLY recommended that you build a timing map using the KILLSHOT™ EFI PC Software for the engine on which the KILLSHOT™ EFI is controlling timing. The timing map built using the Handheld is very basic, and your engine will perform much more optimally with a timing curve built specifically for it.

#### ★ Timing Offset

Use this value to sync timing at higher RPMs. These values are set to 0 in the base calibrations. Some ignition modules may need this number altered if the commanded timing does not match the commanded timing as engine speed increases. If the timing starts to retard as rpm increases, this number can be increased for the timing to match.

## 14.0 Idle Setting

Once the engine is warmed up, the idle speed can be set to what is desired.

Select the Tuning tab. Find the target hot idle speed. Move the button left and right to adjust it. Click the button to save the new value or select CANCEL at the bottom to move out of this screen.

Whether you change the target idle or not, you need to set the throttle plates on the throttle body to an optimal

position. To do so, with the engine running, select the Monitor tab. You will see the Idle screen. Look at the “IAC Position” value. This value should be between 6 and 20 with the engine in neutral and up to operating temperature. Also make sure the “TPS” shows 0. If it is not, you need to perform a TPS Zero Learn.

If the “IAC Position” value is zero, you must close the throttle plates until it reads a value of 6-20. Slowly turn the throttle shaft adjustment screw counterclockwise on the throttle body. If the IAC position is “stuck” at zero, it is likely that the engine is idling at a higher speed than you have set for the target idle speed. You need to adjust the throttle plates to resolve this issue.

If the “IAC Position” value is greater than 20, it is a good idea to open the throttle plates until the “IAC Position” value is between 6 and 20. Do this by turning the throttle shaft adjustment screw clockwise. Note that if you open the throttle plates such that the “TPS” position goes above zero, you will need to shut the vehicle off and perform a TPS Zero Learn. Then, restart the vehicle and continue adjusting the throttle plates.

Once the TPS goes above zero, the ECU goes out of its “idle” mode and will lock the IAC position to a fixed value.

When the adjustments are completed, make sure the TPS reads 0 with the engine idling.

## 15.0 Self-learning

It is time to drive the vehicle and let the system perform the self-learning process. The best way to self-learn is to drive the vehicle under as many different operating conditions as possible - different engine speeds and loads. Start by slowly revving the engine in neutral and holding it at different speeds up to 2500 RPM. This will help the system learn these points. Then drive the vehicle, possibly using different transmission gears to learn in different areas. If you have an automatic transmission, you may want to put it in gear, and with your foot on the brake pedal, apply a SMALL amount of throttle so that the system learns in this area as well.

**NOTE:** There are several conditions where Learning will NOT occur. They are the following:

- If the engine is below 160° F
- When the engine detects quick accelerator pedal movement
- At certain times when the accelerator pedal is released, and the vehicle is coasting
- If learning is disabled by the user

If you would like to see if self-learning is completed in a certain area, follow these instructions in your Handheld:

- 1) Select Monitor from the Main Menu.
- 2) Then select Monitors.
- 3) Select the Fuel Inj PW icon. The Fuel Learn Status indicates if the learn feature is active.

At this point you can drive and enjoy your KILLSHOT™ EFI as it is.

## Diagnostic LEDs

LED #	Function	Color	Definition
1	Power Indicator	Red	System power indicator
2	Engine Running Indicator	Blue	Engine running indicator, Blinking becomes faster with speed
3	Main Relay Indicator	Red	The main relay indicator, the ignition key is turned on, the main relay is turned on, and the key is turned off, the main relay is turned off after the system saves the learning data etc.
4	Fuel Pump Indicator	Blue	Fuel pump relay working indicator



# KILLSHOT Handheld Controller User Guide

The Aces EFI KILLSHOT™ Handheld Programmer utilizes a 5” capacitive touchscreen and six manual buttons. The LCD screen has a large, vividly colored display. The Handheld uses CAN bus communication to the ECU and has a type-C USB interface for programming and other operations. All operations are done by touching the screen or through the manual buttons.

The handheld can be used for monitoring and calibrating the system (for example: idle speeds, AFR targets, fuel pump, etc.) after connecting it with the ECU. It is portable and convenient for tuning at any time.

## 1.0 connection

The handheld is connected to the ECU through the CAN bus, and operations such as program upgrading etc. Can be done through the Type-C USB interface.

## 2.0 Basic Operations

There are six buttons on the handheld controller (three on each side). The user can operate handheld by touching the screen or the buttons on either side to switch the interface, adjust the calibration data, upload/download calibration data, etc.

## 3.0 Operation Interface

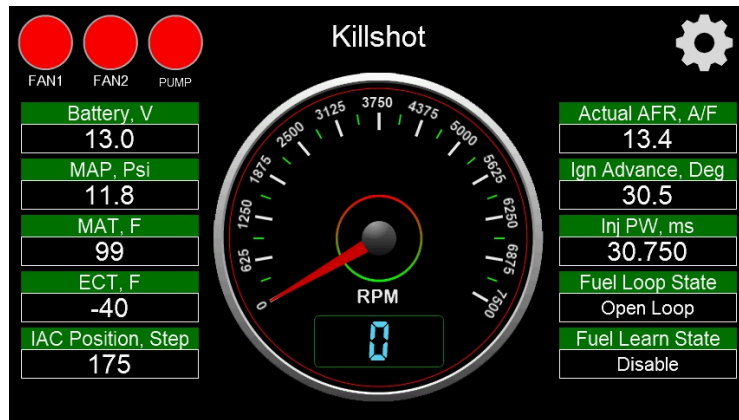
### 3.1 Startup Screen

When the handheld is turned on, it will prompt the user to select the specific system, such as Jackpot, Killshot, High Roller, etc. The system only works properly when connected to the correct corresponding system. If the user selects "Don't show this again in next startup", the handheld controller will automatically enter the system selected in the previous use. If the user wants to change the selection, change it in "Setting" -> "System Select".



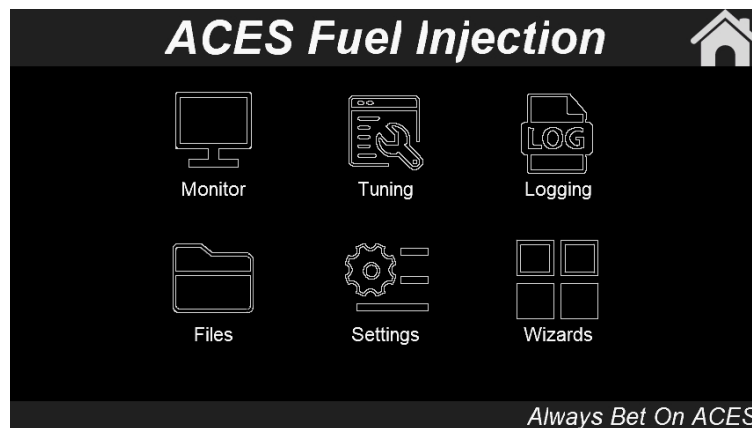
### 3.2 Home Screen

The Home Screen shows RPM and other basic system parameters. The user can also customize the parameters that need to be monitored (more details about customized parameters are covered in a different section). Click the "⚙️" icon in the upper left corner to enter the detailed configuration interface.



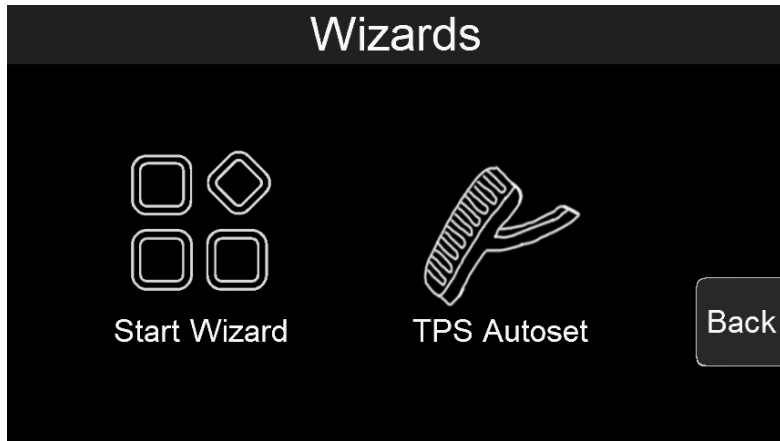
### 3.3 Main Menu

The Main Menu has six selections—Monitor, Tuning, Logging, Files, Settings, Wizards. Click the "🏠" icon in the upper right corner to return to the Home Screen.



### 3.4 Wizards

When the system is powered on for the first time, the user will need to define the engine specifications. Click the "Wizards" icon in the main menu to enter the wizards interface.



### 3.4.1 Start Wizard

Click the "Wizards" icon in the main menu to enter the Wizards interface. Here, the user can define the parameters of their specific combination. The user can click "Next" or "Back" to switch between pages and click "Exit" to exit the wizards. Click the "To Metric Units"/"To Imperial Units" button to switch between imperial or metric units.

<p>Wizard - Camshaft Type</p> <p>Street/Strip</p> <p>Stock/Mild</p> <p>Exit</p> <p>Back</p> <p>Next</p>	<p>"Camshaft Type"</p>
<p>Wizard - Dual WBOS</p> <p>Only WBOS1</p> <p>Dual WBOS</p> <p>Exit</p> <p>Back</p> <p>Next</p>	<p>"Dual WBOS"</p>

Wizard - RPM To Killshot/Ign Type

Magnetic

Coil (-)

CD Ignition Box

Exit

Back

Next

“RPM To Killshot/Ign Type”

Wizard - Number Of Injector

<

4 Numbers

>

Exit

Back

Next

“Number Of Injector”

Wizard - Injector Flowrate

<

100.53 lb/hr

>

Exit

Back

Next

“Injector Flowrate”

Wizard - Engine Displacement

<

348 CID

>

Exit

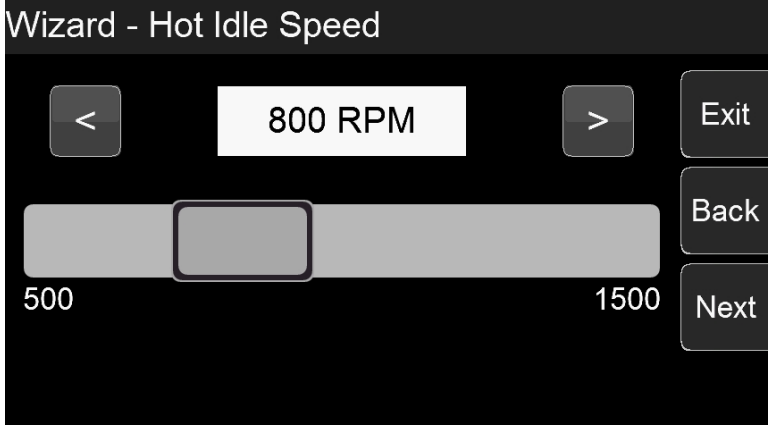
Back

Next

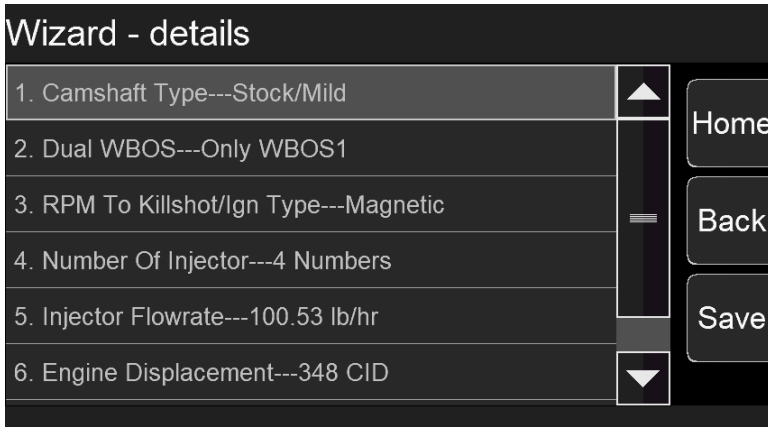
“Engine Displacement”

To Metric Units

To Metric Units



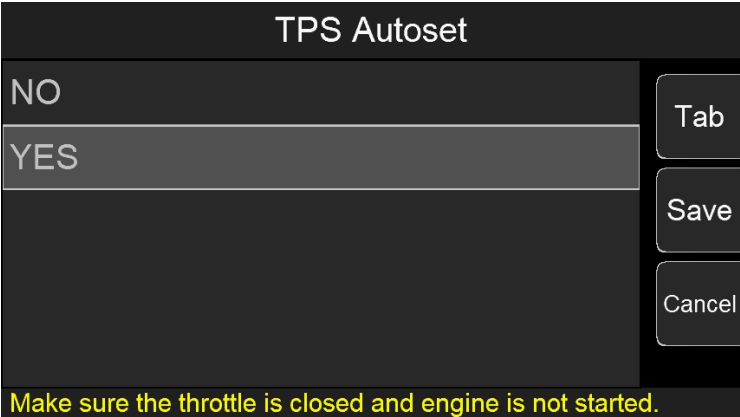
“Hot Idle Speed”



Click "Save" to save the configuration to the ECU, click "Back" to return to wizard for modifying configuration, click "Home" to return to the main menu.

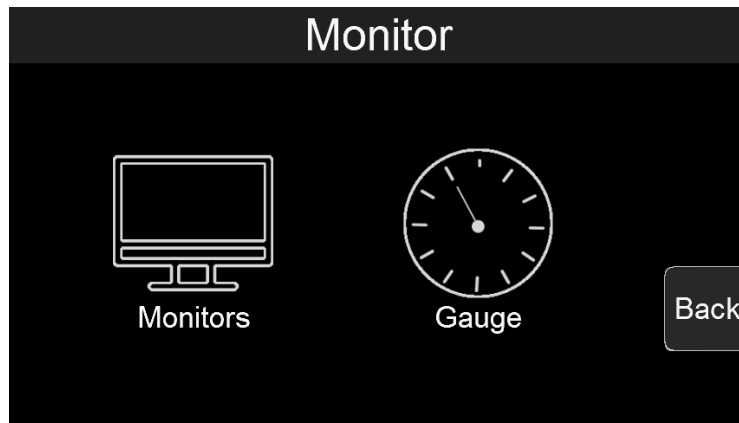
**3.4.2 TPS Autaset**

Click “TPS Autaset” to enter TPS self-learning page. If you select “YES”, make sure the throttle is completely closed and engine is not running.



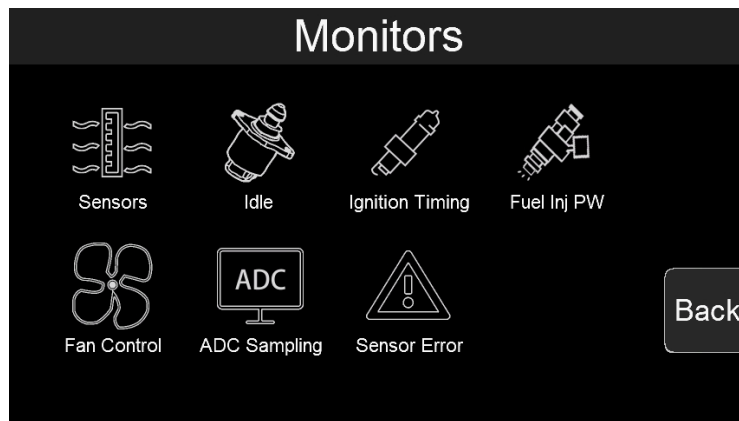
**3.5 Monitor**

Click “Monitor” icon on the Main Menu and it has two selections: Monitors and Gauge. Click “Back” to return to the previous interface.



### 3.5.1 Monitors

1. Click the "Monitors" icon to enter the Monitors interface. Here, each data group is available to select for monitoring. Click the "Tab" button on the right to switch to the next page and click "Back" to return to the previous page.



2. Click the icon of monitored parameter to view the specific data of the system. Click "UP" or "Down" to switch pages and click "Back" to return to the previous interface.

Sensors			
Battery	13.0	V	Up
Run Time	0	Sec	
RPM	0	RPM	Down
MAP	11.8	Psi	
MAT	99	F	Back
ECT	-40	F	
1/4			

### 3.5.2 Gauge

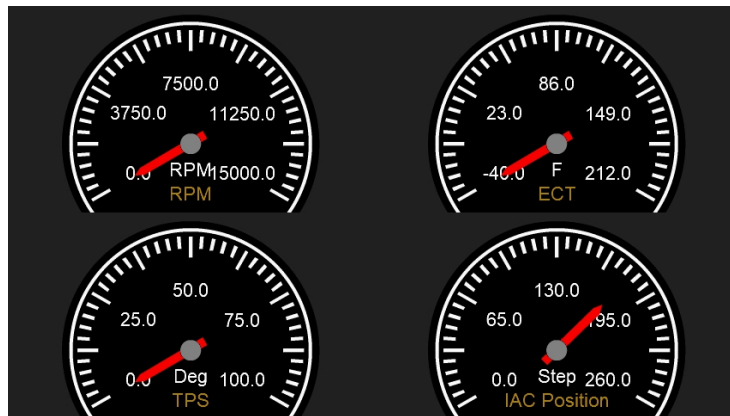
1. Click the "Gauge" icon to enter the Gauge interface. There are three Dashboard configuration and one "Home Setup".

The three Dashboards are customizable allowing you to change how the data is displayed. "Home Setup" can configure the items on the main menu.

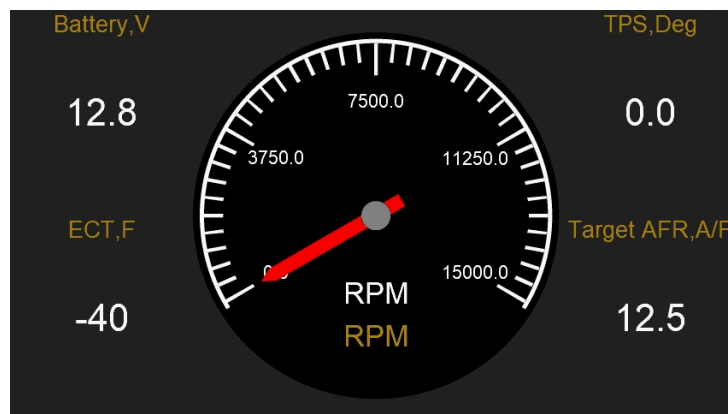


Dash

2. Click "Dash #1" or other Dash icons to enter the Dash interface



Dash #1

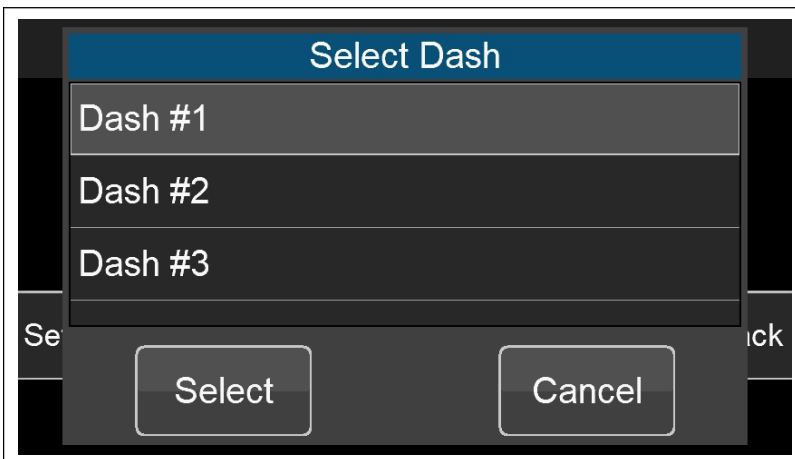
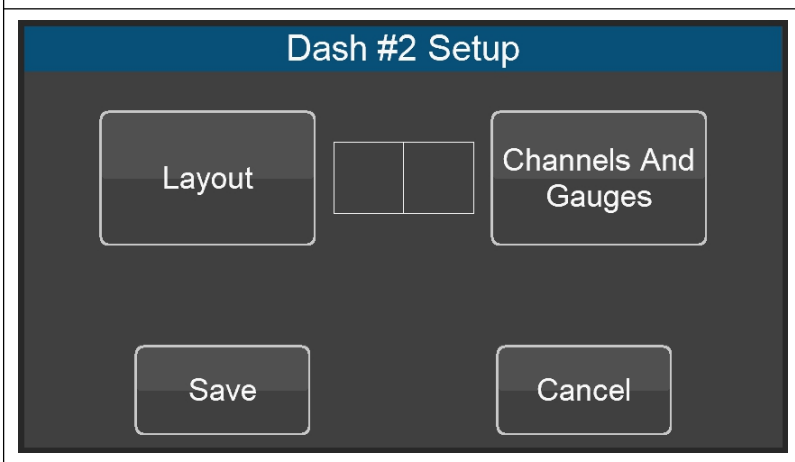


Dash #2

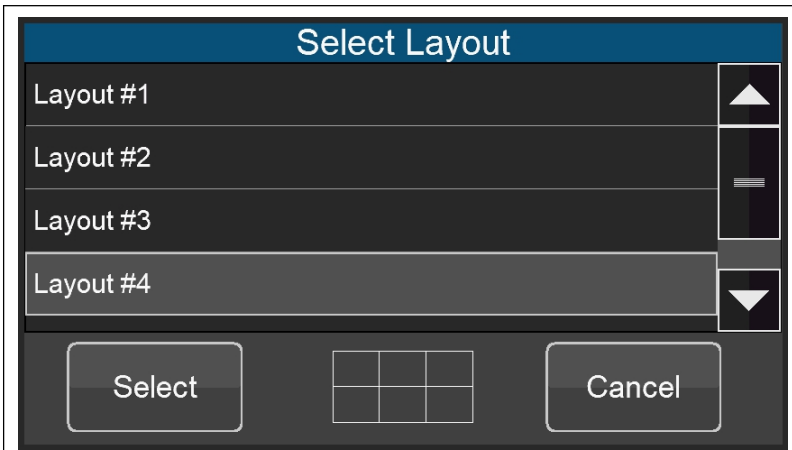
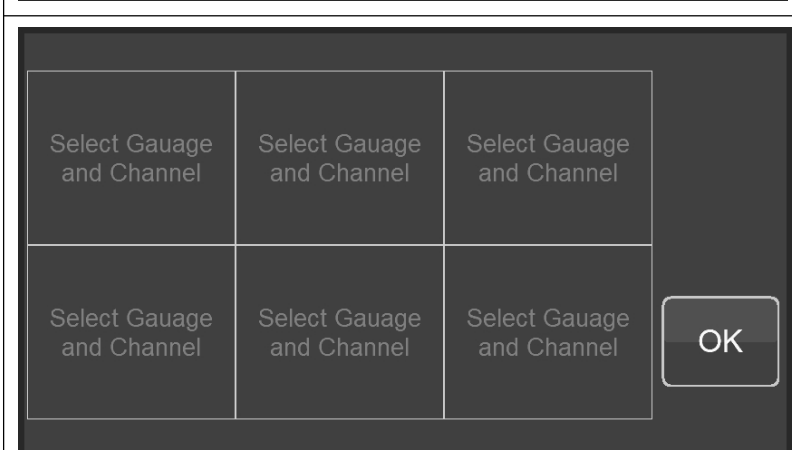
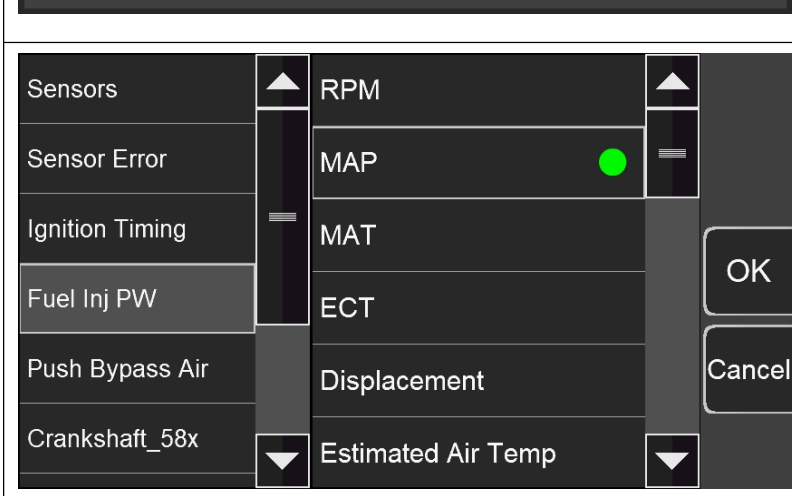
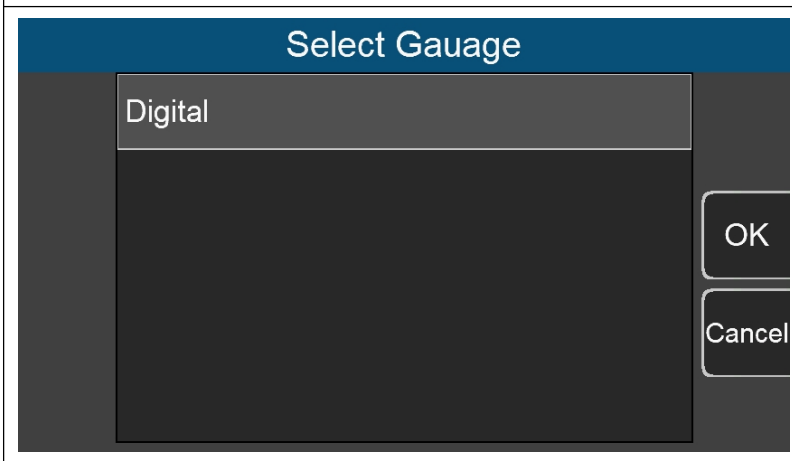
Battery,V	Run Time,Sec	RPM,RPM
12.8	0	0
MAP,Psi	ECT,F	Ign Advance,Deg
79.8	-40	7.4

Dash #3

3. Click "Setup" in the lower left corner to customize the configuration of the three Dashes.

	<p>Select the Dash that needs to be customized.</p>
	<p>Click "Layout" to configure the layout, click "Channels and Gauges" to configure the channels, click "Save" after the configuration is complete, and click "Cancel" to cancel the save.</p>



	<p>Enter Layout interface to select Layout, click "Select" to select Layout, click "Cancel" to cancel the selection.</p>
	<p>Click "Channels and Gauges" to enter the channel selection interface, click "Select Gauge and Channel" to select a specific channel, and click "OK" after the configuration is complete.</p>
	<p>Select the object to be monitored. The left side is the monitoring group, and the right side is each item of the group.</p>
	<p>Choose the type of Dash. There are three types of Dash (Digital, State, and Round) for each monitor to choose.</p>

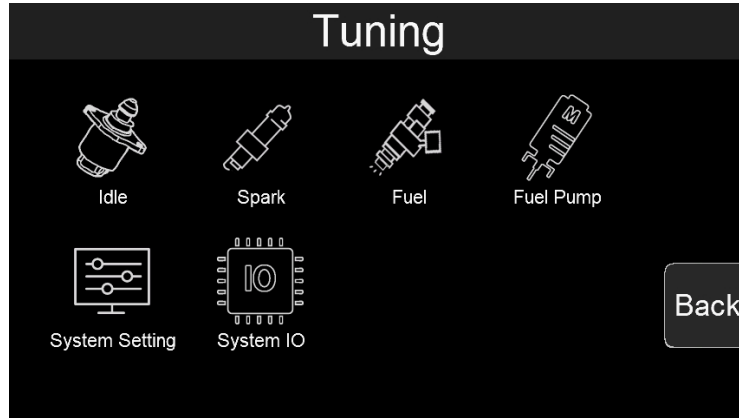
Battery,V	Crank Advance,Deg	Crankshaft State	<p>After the configuration is complete, click Dash #1 to observe the configuration effect.</p>
13.4	7.4	STOP	
TPS,Deg	MAP,Psi	Fan1 On ECT,F	
0.0	72.5	176	

4. Click "Home Setup" to enter the Home Setup interface. Click the item in the cells to modify the configuration. For example, click "Battery" to enter the channel selection interface. Click "Save" to save and click "Cancel" to cancel the modification.

The left side is the monitoring group, and the right side is the monitoring object of the monitoring group.

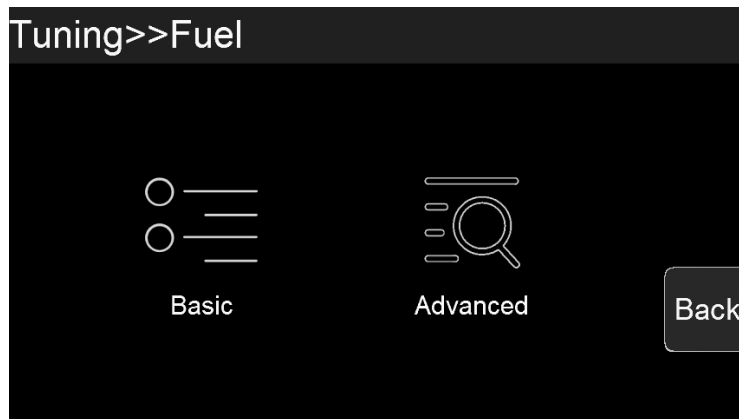
### 3.6 Tuning

Click the "Tuning" icon on the Main Menu to enter the Tuning interface. This interface allows you to select specific groups of parameters for tuning. Click the icons to view the system calibration data. Click "Tab" to switch the selected tuning options, click "Enter" to calibrate the selected item, and click "Back" to return.

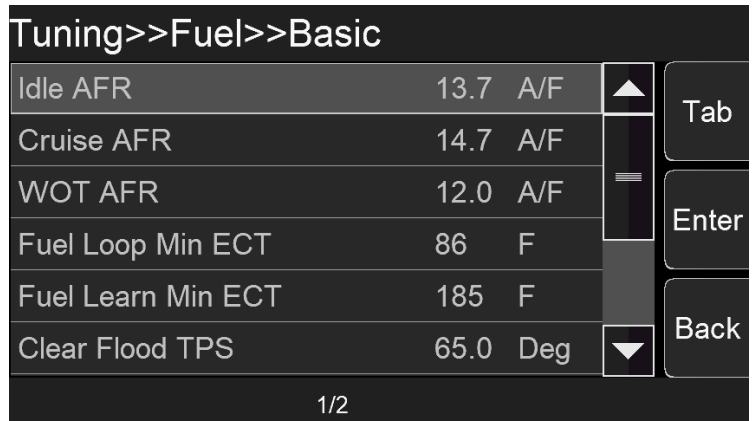


#### 3.6.1 Tuning Groups

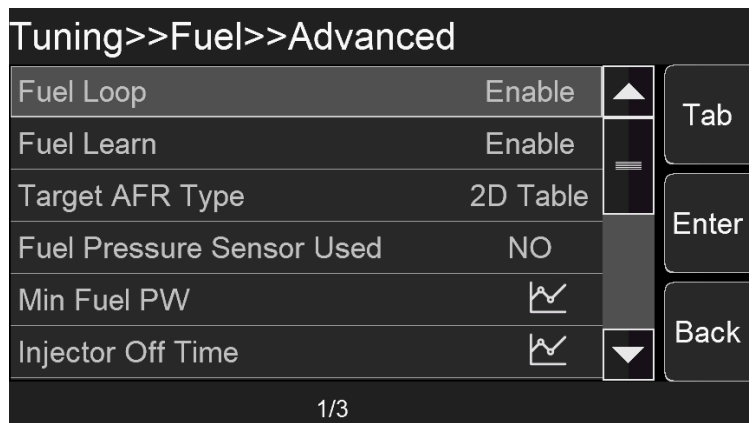
Click the "Fuel" icon to enter "Tuning>>Fuel", which is divided into basic calibration group and advanced calibration group. Click "Basic" to enter the basic calibration group and click "Advanced" to enter the advanced calibration group.



” Tuning>>Fuel”



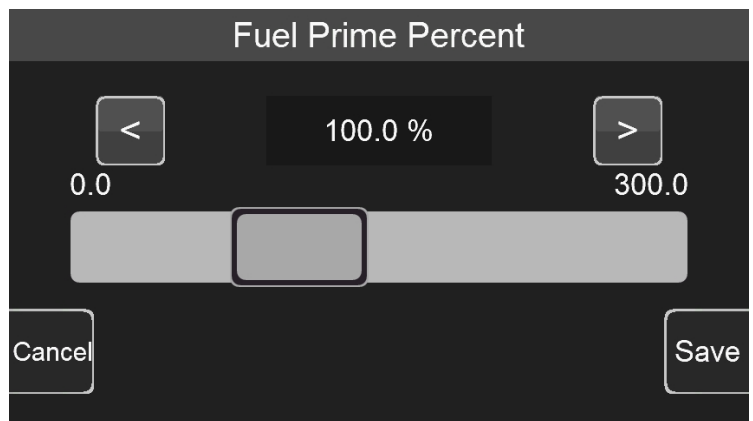
“Tunning>>Fuel>>Basic”



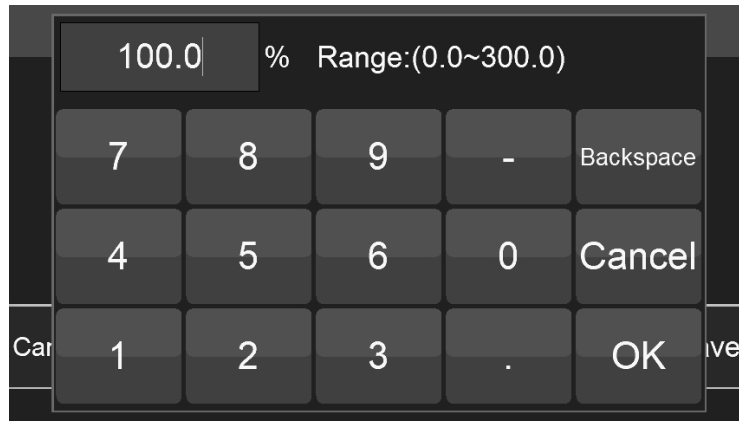
“Tunning>>Fuel>>Advanced”

### 3.6.2 Making Adjustments

1. Slider Bar: Slide the bar or click "<" and ">" to adjust the parameters, click "Save" to save, and click "Cancel" to cancel saving.

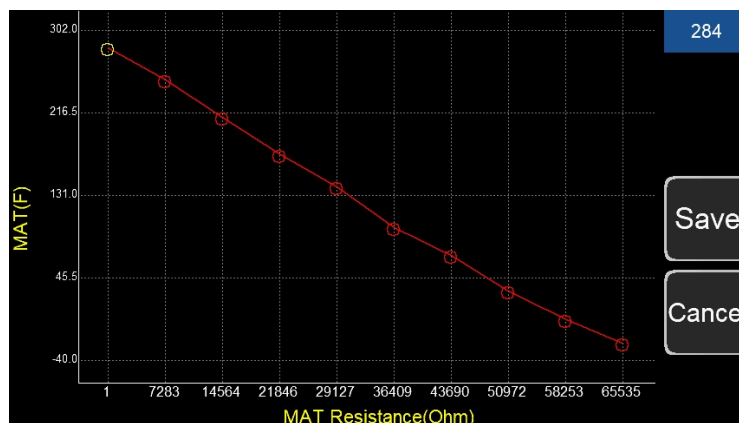
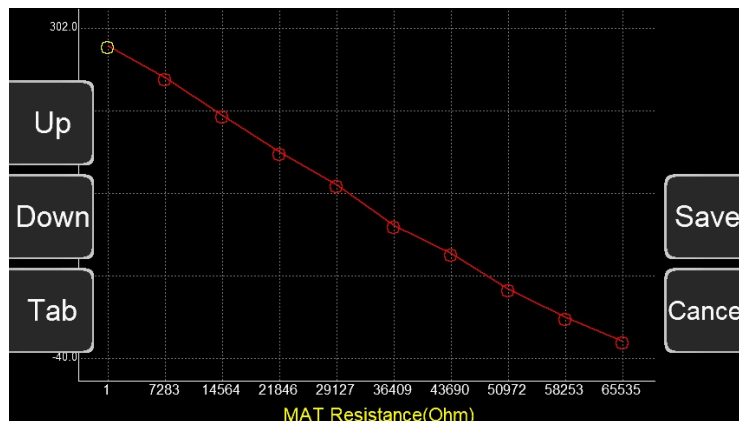


2. Numeric keyboard: Click the edit box "100.0%" above the sliding bar to pop up the numeric keyboard.



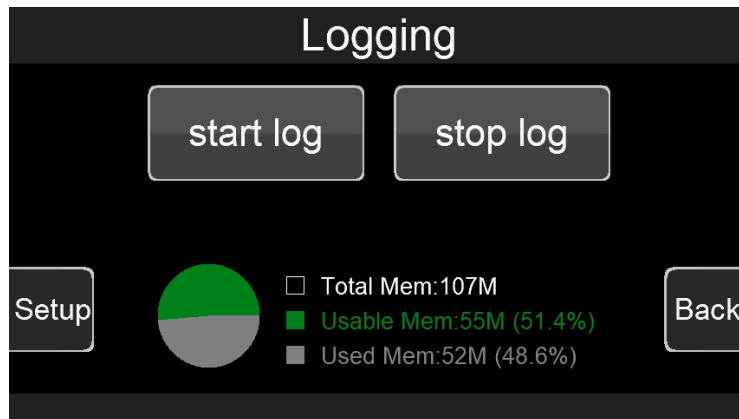
3. 2D Graph: The user can drag the red dot on the graph or click the mechanical button on the left to adjust the parameters. When adjusting the parameters, the upper right corner will display the Y-axis coordinate value of the adjusted parameter. The three buttons on the left side of the interface will disappear after a short display. Click the mechanical button on the lower left corner to switch the position of the small yellow dot, click the middle button on the left to lower the yellow dot, and click the mechanical button in the upper left corner to raise the yellow dot. The Y-axis coordinate value of the yellow dot is displayed in the upper right corner of the interface.

After the configuration is complete, click "Save" to download the calibration data to the ECU; click "Cancel" to cancel the modification.

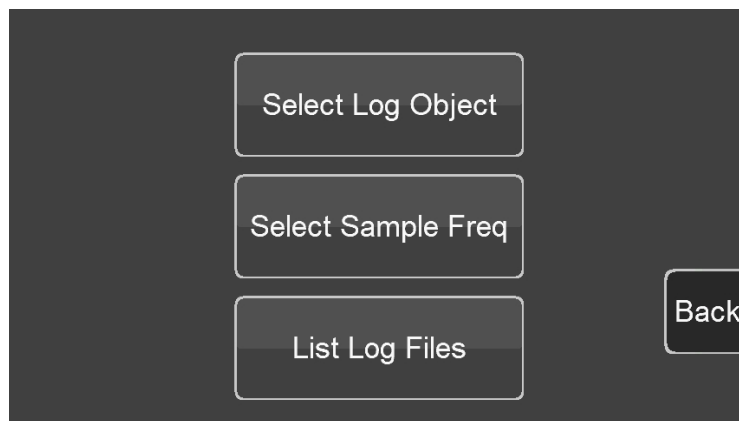


### 3.7 Logging

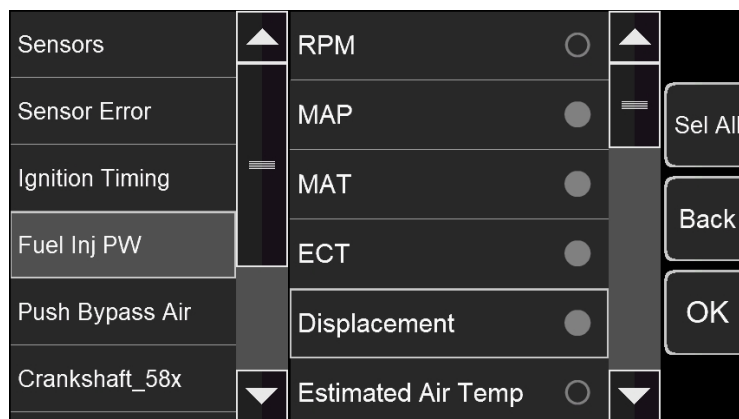
Click the "Logging" icon on the Main Menu to enter the logging interface. Click "start log" to start logging and click "stop log" to stop logging. This interface also shows the current memory usage of the handheld.



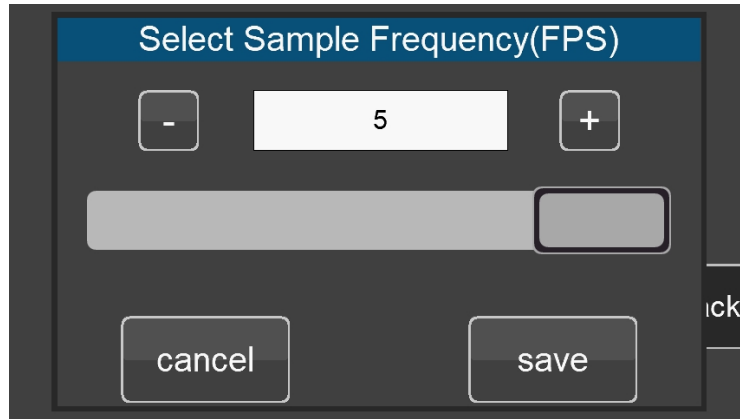
1. Click the "Setup" button in the lower left corner to enter the log configuration interface.



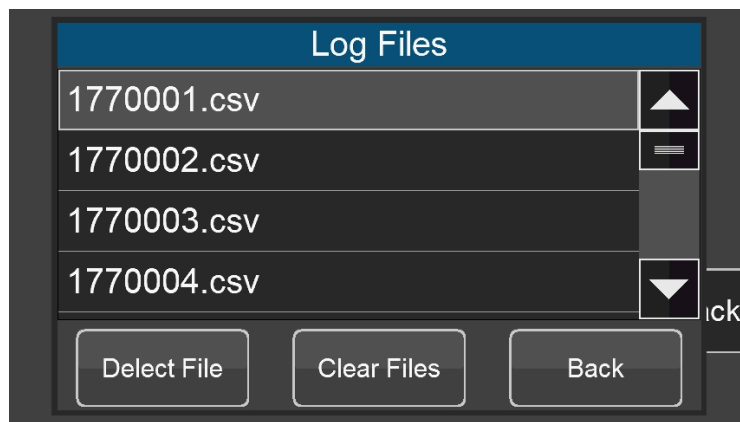
2. To datalog one specific parameter, click "Select Log Object" and select the object you wish to datalog. To datalog multiple parameters, select the log group on the left, then select the objects in this group you wish to datalog. Click "Sel All" to select all the objects in the group for datalogging and click "OK" to save.



3. Click "Select Sample Freq" to select the logging frequency, click "Save" to save, and click "Cancel" to cancel the modification.

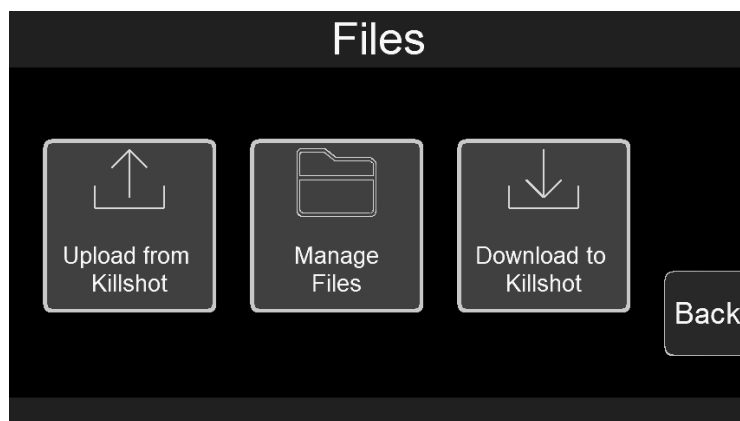


4. Click "List Log Files" to view, delete, or empty the datalog files.



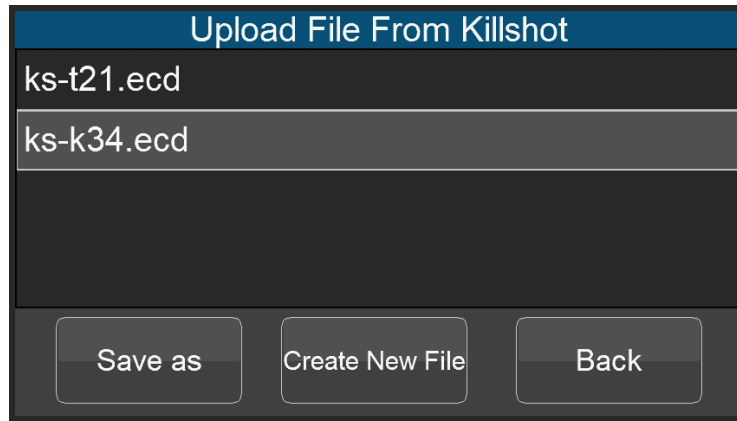
### 3.8 Files

Click the "Files" icon on the Main Menu to enter the file interface. This is where you can upload and download the calibration data and manage the calibration data files.



#### 3.8.1 Uploading Calibration Data

1. Click "Upload from Killshot" to upload ECU calibration data and save it.



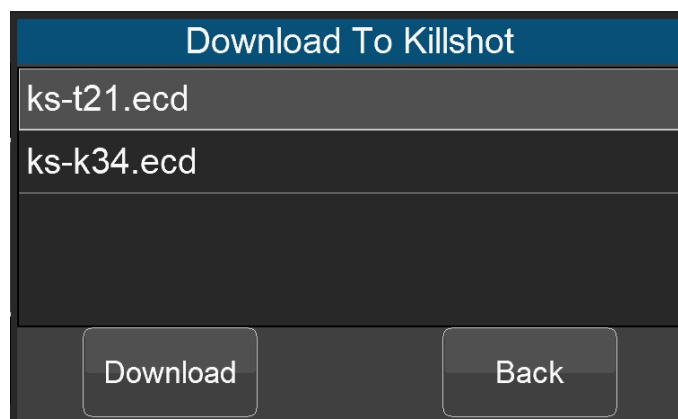
2. Click "Save as" to save the uploaded data to the currently selected file. Note that the calibration data of the selected file will be replaced by the new calibration data.

3. Click "Create New File" to create a new file to save the calibration data, and the user can customize file name.



### 3.8.2 Downloading Calibration Data

Click "Download to Killshot" to download the calibration data to the ECU. Select the calibration data file to be downloaded and click "Download" to download it to the ECU.

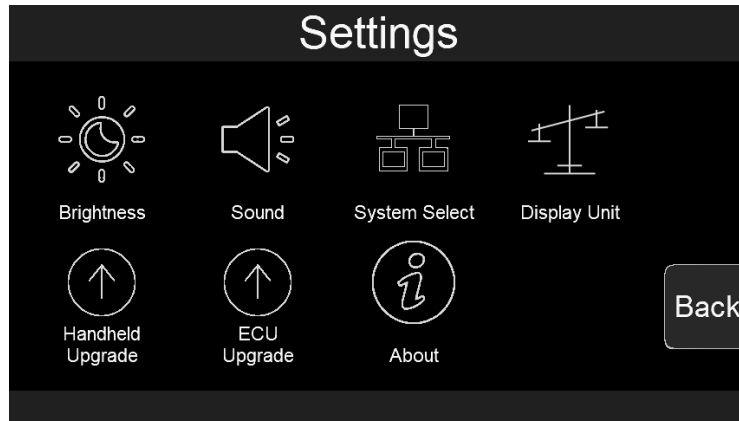


### 3.9 Settings

Click the "Settings" icon on the Main Menu to enter the settings interface, where you can set the display brightness,

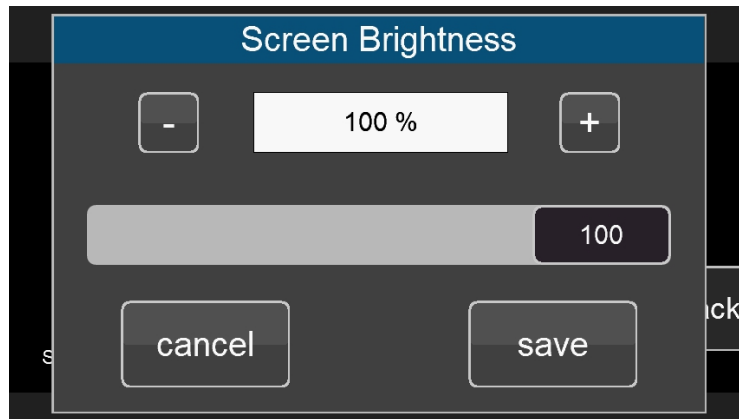


sound effects, display unit, upgrade, etc.



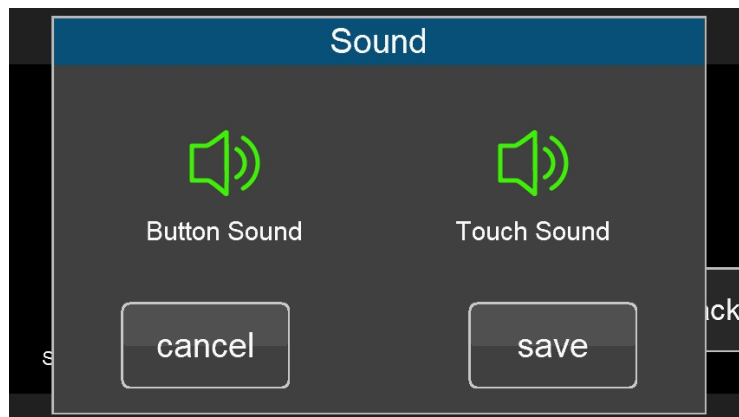
### 3.9.1 Screen Brightness Setting

Click the "Brightness" icon to enter the brightness setting interface. You can slide the bar or click the "-" and "+" to set the screen brightness. After the setting is completed, click "Save" to save the settings, and click "Cancel" to cancel saving the changes.



### 3.9.2 Sound Setting

Click the "Sound" icon to enter the sound effect setting interface and click the horn icon to switch the sound effect. "Button Sound" is the sound effect switch for mechanical buttons, and "Touch Sound" is the touch sound effect switch. After the setting is completed, click "Save" to save the setting, and click "Cancel" to cancel the saving and modification.



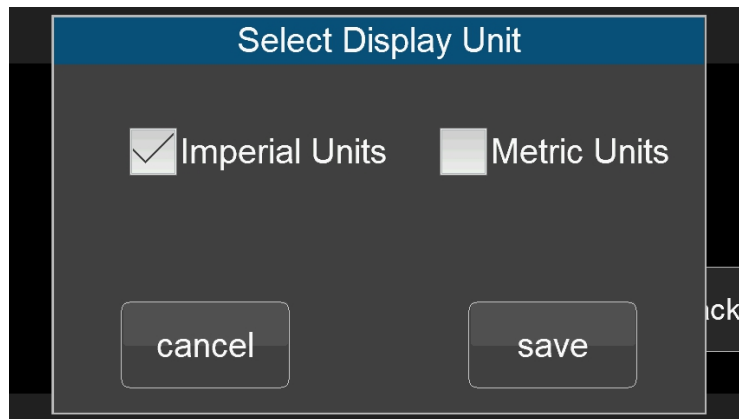
### 3.9.3 Select System

Click the "System Select" icon to enter the system selection interface. The user selects the corresponding system according to the product. If the correct product is not selected, the system will not work right.



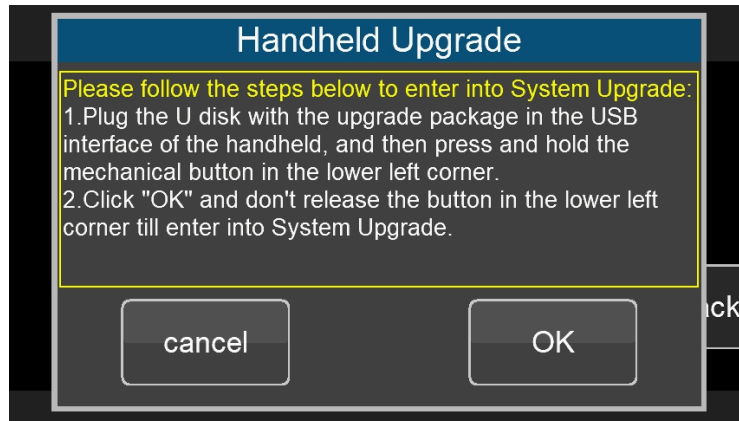
### 3.9.4 Select Display Unit

Click the "Display Unit" icon to enter the display unit setting interface. The user can select the imperial units or the metric units. After the setting is completed, click "Save" to save the setting, and click "Cancel" to cancel the saving and modification.



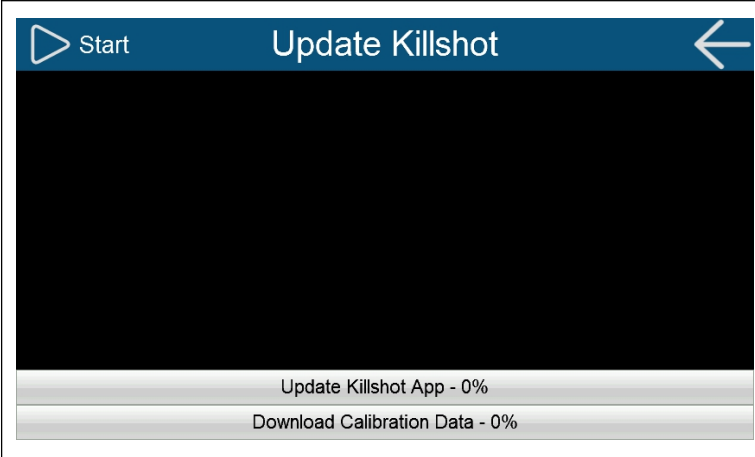
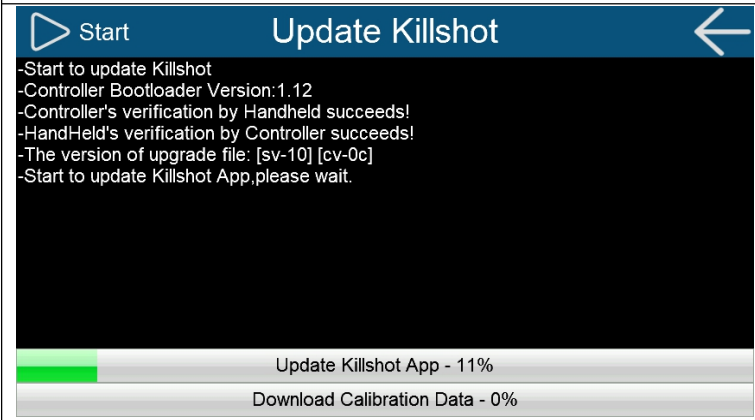

### 3.9.5 System Upgrade

Click "Handheld Upgrade" and follow the prompts to upgrade the Handheld.



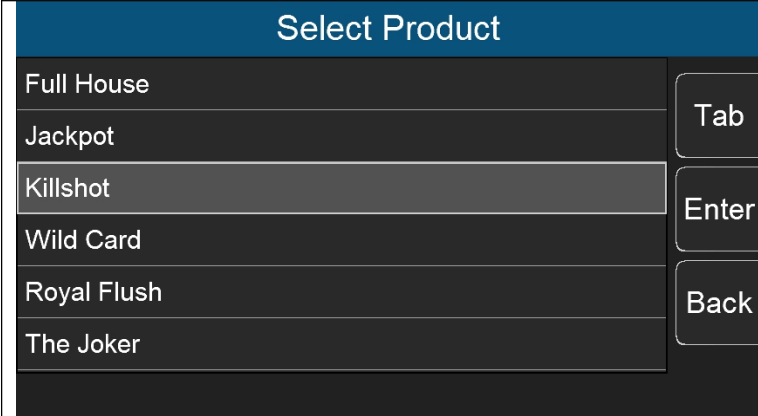
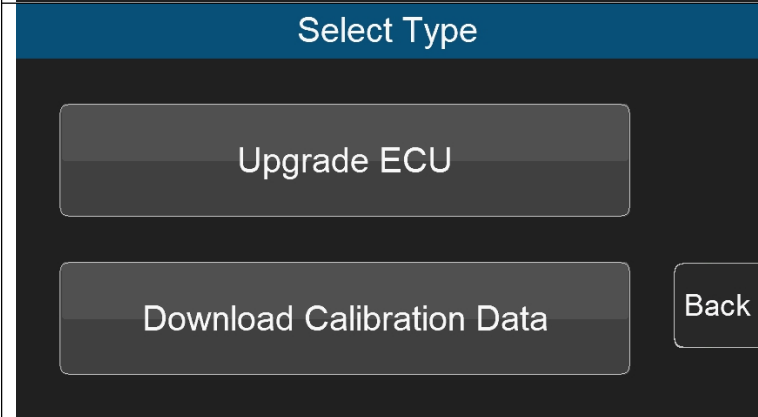
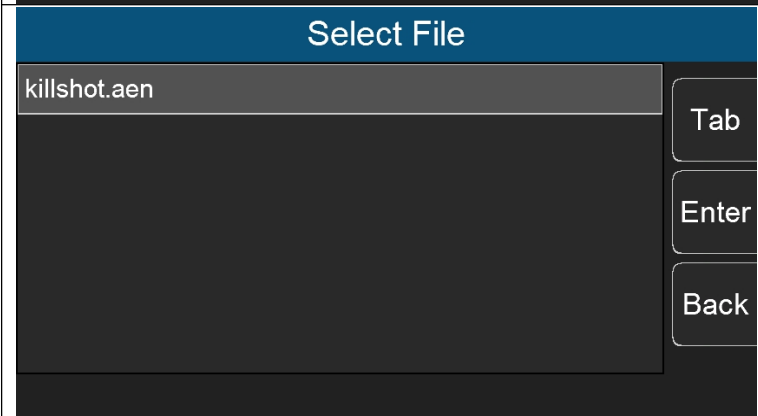



### 3.9.6 ECU Upgrade

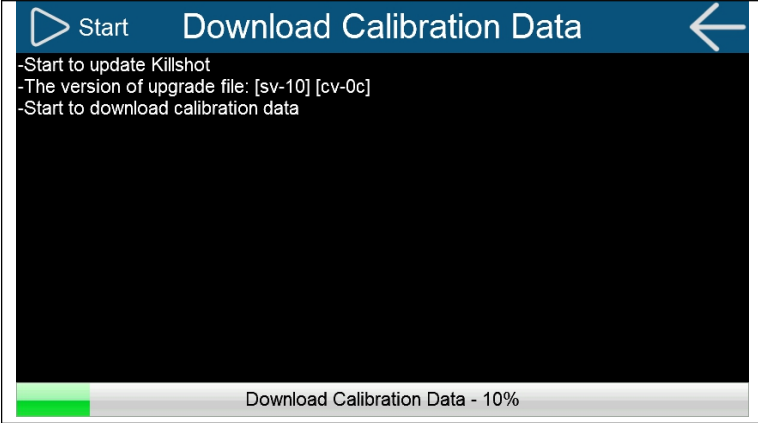
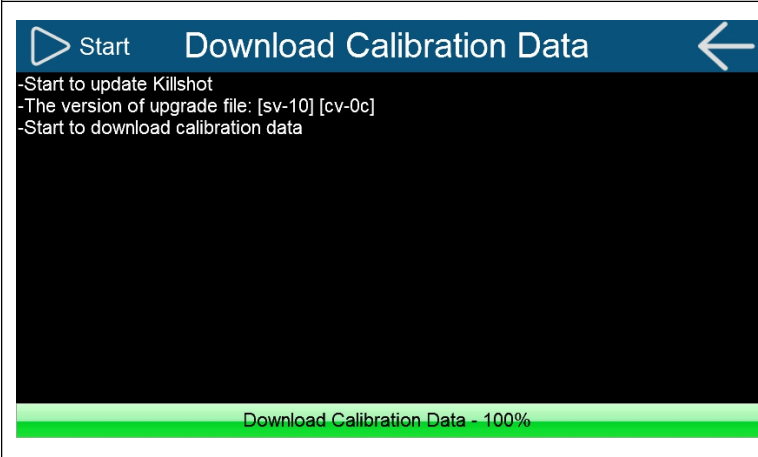
<p><b>Select Product</b></p> <p>Full House</p> <p>Jackpot</p> <p>Killshot</p> <p>Wild Card</p> <p>Royal Flush</p> <p>The Joker</p> <p>Tab</p> <p>Enter</p> <p>Back</p>	<p>Select the Product to be Upgraded</p>
<p><b>Select Type</b></p> <p>Upgrade ECU</p> <p>Download Calibration Data</p> <p>Back</p>	<p>Click "Upgrade ECU"</p>
<p><b>Select File</b></p> <p>killshot.aen</p> <p>Tab</p> <p>Enter</p> <p>Back</p>	<p>Select Upgrade File</p>

	<p>Click “▶” button in the upper left corner or click the mechanical button in the upper left corner to start the upgrade. After the upgrade completes, click “◀” in the upper right corner to return.</p>
	<p>Upgrading the system and downloading the calibration data.</p>
	<p>Upgrade completes.</p>

### 3.9.7 Download Calibration Data

Click the "ECU Upgrade" icon to enter ECU upgrade interface, and the user can select the corresponding product and file to download the calibration data.

	<p>Select the Product to be Upgraded</p>
	<p>Click "Download Calibration Data"</p>
	<p>Select calibration file for kill shot</p>
	<p>Click "" button in the upper left corner or click the mechanical button in the upper left corner to start to download. After downloading completes, click "" in the upper right corner to return.</p>

	<p>Downloading calibration data</p>
	<p>Downloading completes</p>

## 4.0 System Updates

### 4.1 Handheld Update

There are two ways to update and/or upgrade the handheld:

1. Copy the Handheld upgrade package into the USB flash drive. Before powering on, plug the USB flash drive into the USB interface of the handheld, press and hold the mechanical button in the lower left corner, and then power on. The system will pop up the upgrade interface when the system detects the upgrade package. At this time, release the button, and the system will automatically upgrade.

(Note: Do not perform any operation on the handheld before it prompts to unplug the U disk)

2. Enter the system setting interface, click the "Handheld Upgrade" icon, and follow the prompts to upgrade. First plug the U disk with the upgrade package into the USB interface of the handheld, then press and hold the mechanical button in the lower left corner, and then click "OK". When the system upgrade interface appears, you can release the mechanical button in the lower left corner.

### 4.2 Version Detection

After powering on the Handheld and entering the system, it will automatically detect and compare the version information of the handheld and the product. If the two versions do not match, the user will be prompted to update the system, otherwise it will not work right.

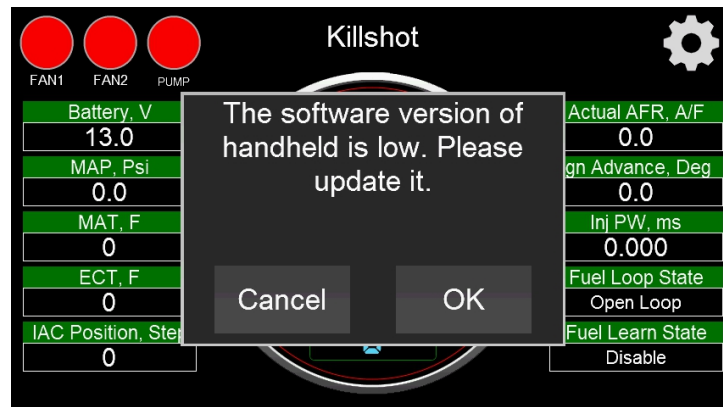
#### 4.2.1 When ECU version is Out of Date (Low)

When ECU version is too out of date (low), the user needs to update the ECU, otherwise it cannot work properly. Click "OK" to enter the ECU update interface and click "Cancel" to cancel the update. Users can also go to "Setting" -> "ECU Upgrade" to update ECU by themselves.



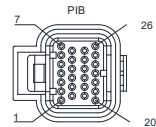
#### 4.2.2 When Handheld software version is Out of Date (low)

When Handheld software Version is out of date (low), the user needs to update the handheld, otherwise it cannot work properly. Click "OK" to enter the handheld update interface and click "Cancel" to cancel the update. Users can also go to the "Setting" -> "Handheld Upgrade" interface by themselves and follow the prompts to update the Handheld.



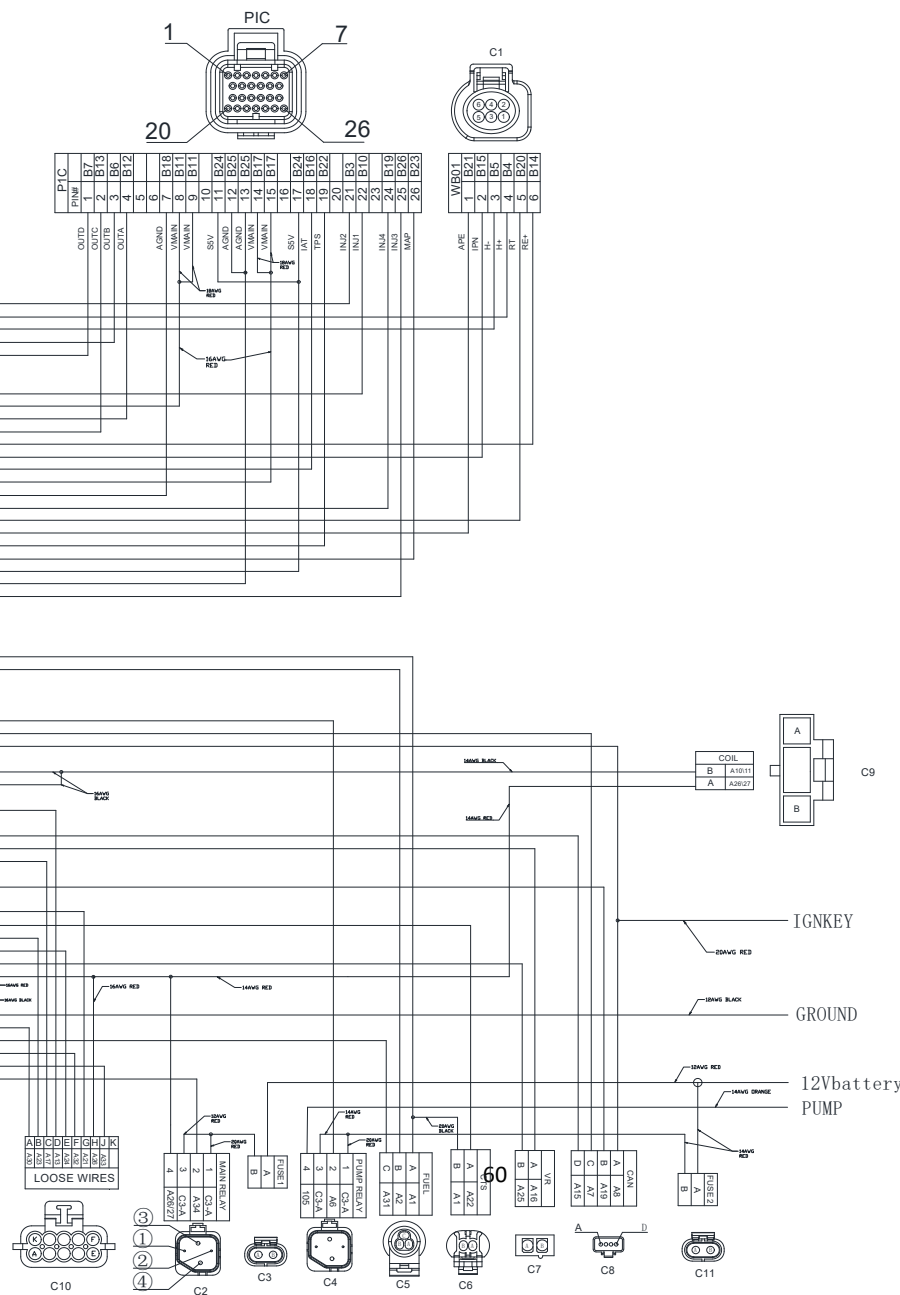
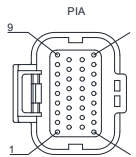
PIA PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	4-1437290-0	
2	PINS	3-1447221-4	20AWG

PIN	AWG	COLOUR	
1			
2			
3	18	GREY	INJ2
4	20	RED	VMAIN
5	20	BROWN	HT1
6	20	GREEN	OUTB
7	20	YELLOW	OUTD
8			
9			
10	18	PURPLE	INJ1
11	18	RED	VMAIN
12	20	PURPLE	OUTA
13	20	BLUE	OUTC
14	20	ORANGE	IPN1
15	20	YELLOW	IAT
16	20	WHITE	RE1+
17	16	RED	VMAIN
18	20	BLACK	AGND
19	18	WHITE	RT1
20	20	BLACK	INJ4
21	20	WHITE	APE1
22	20	BROWN	TPS
23	20	BLUE	MAP
24	20	ORANGE	AGND
25	20	BLACK	INJ3
26	18	GREEN	



PIN	AWG	COLOUR	
1	20	BLACK	AGND
2	20	ORANGE	SSV
3			
4			
5	20	BLACK	RLY_PUMP
6	20	WHITE	CANH
7	20	RED	IGNSW
8	20	RED	
9			
10	16	BLACK	COIL-
11	16	BLACK	COIL-
12			
13	20	YELLOW	FAN2
14			
15	20	GREEN	CANL
16	20	PURPLE	VR+
17	20	GREY	CRANK_IN
18			
19	20	BLACK	GND
20			
21	20	PURPLE	Nitrous_IN
22	20	BLUE	CTS
23	20	BROWN	TACHOUT
24	20	BLUE	REV
25	20	GREEN	VR-
26	18	RED	VMAIN
27	16	RED	VMAIN
28	16	BLACK	GND
29	16	BLACK	GND
30	20	ORANGE	AC_IN
31	20	PURPLE	FPS
32	20	GREEN	FAN1
33	20	WHITE	POINT_OUT
34	20	BLACK	MIRD

PIB/C PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	3-1437290-7	
2	PINS	3-1447221-4	20AWG



C1 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7064B-1.5-21	
2	PINS		20AWG

C2/4 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7057Y-6.5-21	
2	PINS		14AWG

C3/11 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ70232Y-6.3-21	
2	PINS		14AWG

C5 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7034YA-1.5-21	
2	PINS		20AWG

C6 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7022YB-1.5-21	
2	PINS		20AWG

C7 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	IDE 2PIN	
2	PINS	HX63080-PT	20AWG

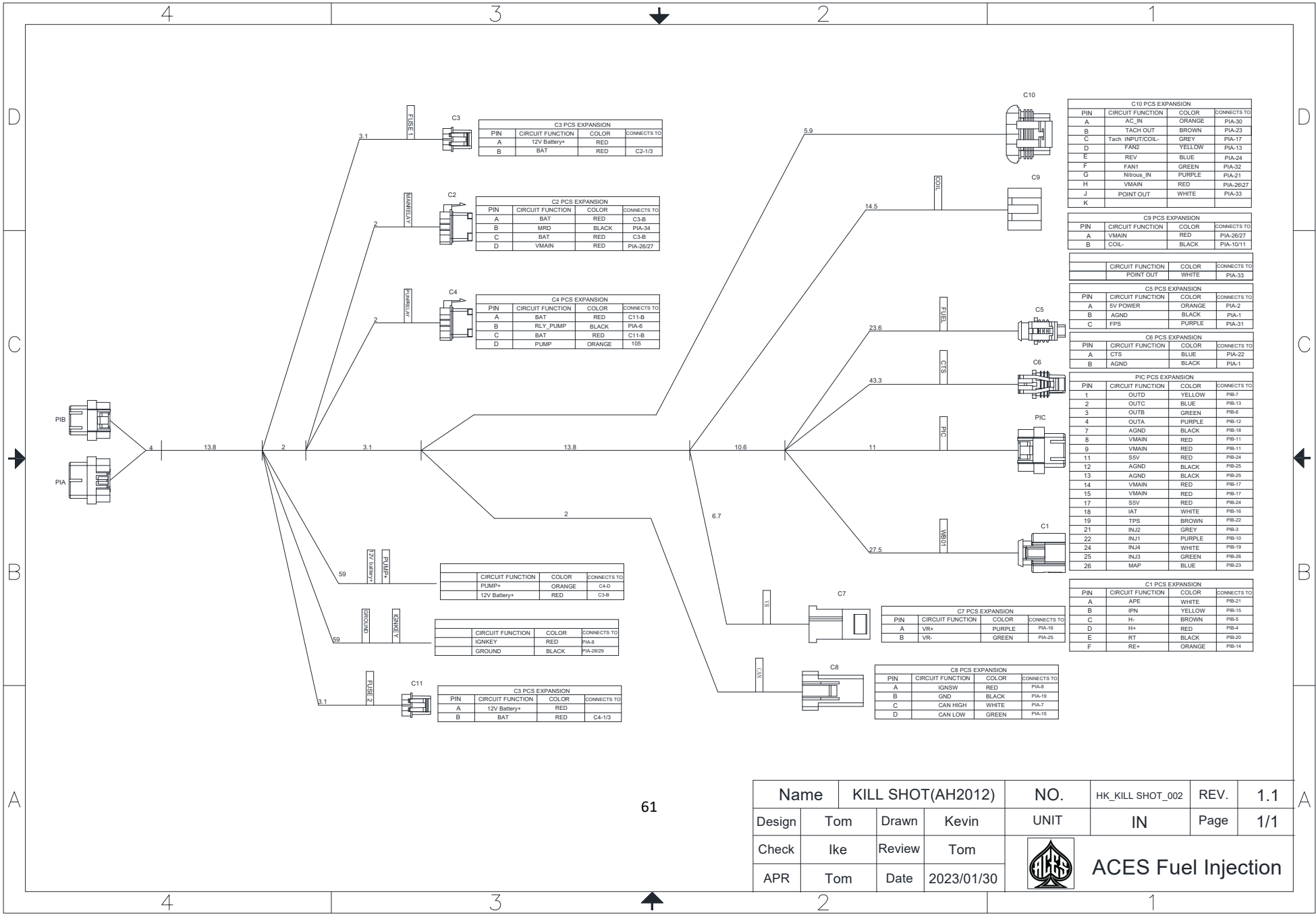
C8 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	JST04R-JWPF-VSLE	
2	PINS	SWPR-001T	20AWG

C9 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7033YA-6.3-21	
2	PINS		14AWG

C10 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7101Y-1.5-21	
2	PINS		20AWG

Name	KILL SHOT(AH2012)		NO.	HK_KILL_SHOT_001		REV.	1.2
Design	Tom	Drawn	Kevin	UNIT	IN	Page	1/1
Check	Ike	Review	Tom				
APR	Tom	Date	2023/05/06				





PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	12V Battery+	RED	
B	BAT	RED	C2-1/3

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	BAT	RED	C3-B
B	MRD	BLACK	PIA-34
C	BAT	RED	C3-B
D	VMAIN	RED	PIA-26/27

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	BAT	RED	C11-B
B	RLY_PUMP	BLACK	PIA-6
C	BAT	RED	C11-B
D	PUMP	ORANGE	105

CIRCUIT FUNCTION	COLOR	CONNECTS TO
PUMP+	ORANGE	C4-D
12V Battery+	RED	C3-B

CIRCUIT FUNCTION	COLOR	CONNECTS TO
IGNKEY	RED	PIA-8
GROUND	BLACK	PIA-28/29

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	12V Battery+	RED	
B	BAT	RED	C4-1/3

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	VR+	PURPLE	PIA-16
B	VR-	GREEN	PIA-25

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	IGNSW	RED	PIA-8
B	GND	BLACK	PIA-19
C	CAN HIGH	WHITE	PIA-7
D	CAN LOW	GREEN	PIA-15

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	AC_IN	ORANGE	PIA-30
B	TACH OUT	BROWN	PIA-23
C	Tach INPUT/CODL-	GREY	PIA-17
D	FAN2	YELLOW	PIA-13
E	REV	BLUE	PIA-24
F	FAN1	GREEN	PIA-32
G	Nitrou_IN	PURPLE	PIA-21
H	VMAIN	RED	PIA-26/27
J	POINT OUT	WHITE	PIA-33
K			

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	VMAIN	RED	PIA-26/27
B	COL-	BLACK	PIA-10/11

CIRCUIT FUNCTION	COLOR	CONNECTS TO
POINT OUT	WHITE	PIA-33


PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	5V POWER	ORANGE	PIA-2
B	AGND	BLACK	PIA-1
C	FPS	PURPLE	PIA-31

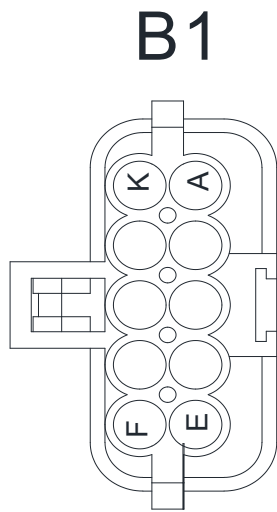
PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	CTS	BLUE	PIA-22
B	AGND	BLACK	PIA-1

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
1	OUTD	YELLOW	P1B-7
2	OUTC	BLUE	P1B-13
3	OUTB	GREEN	P1B-6
4	OUTA	PURPLE	P1B-12
7	AGND	BLACK	P1B-18
8	VMAIN	RED	P1B-11
9	VMIN	RED	P1B-11
11	SSV	RED	P1B-24
12	AGND	BLACK	P1B-25
13	AGND	BLACK	P1B-25
14	VMAIN	RED	P1B-17
15	VMIN	RED	P1B-17
17	SSV	RED	P1B-24
18	IAT	WHITE	P1B-16
19	TPS	BROWN	P1B-22
21	INJ2	GREY	P1B-3
22	INJ1	PURPLE	P1B-10
24	INJ4	WHITE	P1B-19
25	INJ3	GREEN	P1B-26
26	MAP	BLUE	P1B-23

PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	APE	WHITE	P1B-21
B	IPN	YELLOW	P1B-15
C	H+	BROWN	P1B-5
D	H+	RED	P1B-4
E	RT	BLACK	P1B-20
F	RE+	ORANGE	P1B-14

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Name	KILL SHOT(AH2012)		NO.	HK_KILL_SHOT_002	REV.	1.1
Design	Tom	Drawn	Kevin	UNIT	IN	Page 1/1
Check	Ike	Review	Tom		<b>ACES Fuel Injection</b>	
APR	Tom	Date	2023/01/30			



PIN	AWG	CLOUR
K		
J	20	WHITE
H	16	RED
G	20	PURPLE
F	20	GREEN
E	20	BLUE
D	20	YELLOW
C	20	GREY
B	20	BROWN
A	20	ORANGE

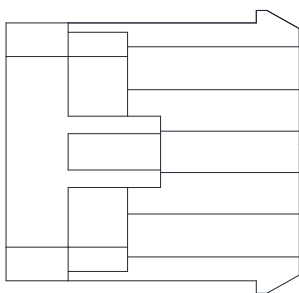
POINT
VMAIN
Nitrous_IN
FAN1
REV
FAN2
TACH INPUT/COIL-
TACH_OUT
AC_IN

B1 PCS EXPANSION			
QTY	DESCRIPTION	PIN	NOTES
1	CONNECTOR	DJ7101Y-1.5-11	
2	PINS		20AWG

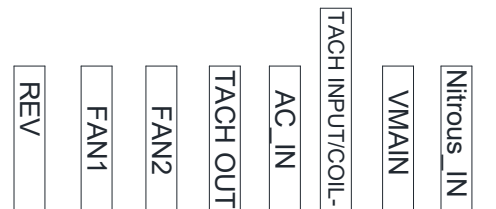
Name		KILL SHOT(AH2012)		NO.	HK_KILL SHOT_003	REV.	1.0
Design	Tom	Drawn	Kevin	UNIT	IN	Page	1/1
Check	Ike	Review	Tom	 <b>ACES Fuel Injection</b>			
APR	Tom	Date	2023/05/06				

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# B1



39.4



B1 PCS EXPANSION			
PIN	CIRCUIT FUNCTION	COLOR	CONNECTS TO
A	AC_IN	ORANGE	PIA-30
B	TACH OUT	BROWN	PIA-23
C	Tach INPUT/COIL-	GREY	PIA-17
D	FAN2	YELLOW	PIA-13
E	REV	BLUE	PIA-24
F	FAN1	GREEN	PIA-32
G	Nitrous_IN	PURPLE	PIA-21
H	VMAIN	RED	PIA-26\27

63

Name		KILL SHOT(AH2012)		NO.	HK_KILL SHOT_004	REV.	1.1
Design	Tom	Drawn	Kevin	UNIT	IN	Page	1/1
Check	Ike	Review	Tom	 <b>ACES Fuel Injection</b>			
APR	Tom	Date	2023/01/30				

**ACES FUEL INJECTION**

**10188 Dayton Pike**

**Soddy Daisy, TN37379**

**(423) 590-ACES**

**[www.acesefi.com](http://www.acesefi.com)**

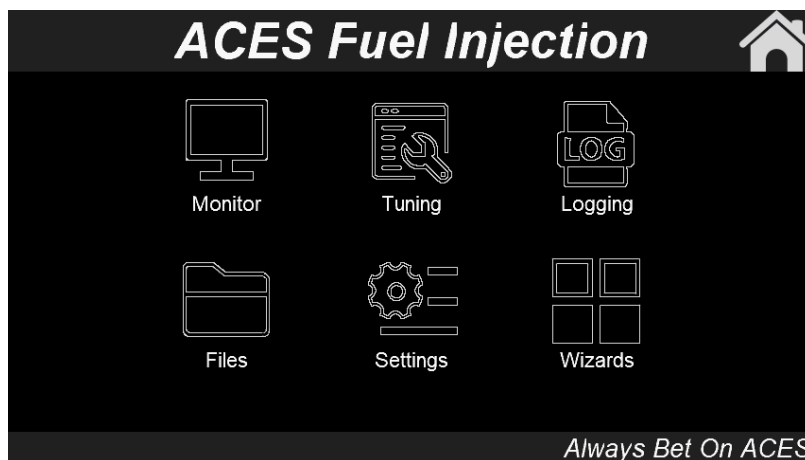


The KILLSHOT™ EFI system allows users to adjust some basic tuning settings to optimize engine performance. Tuning is split up into “Basic” and “Advanced.”

Basic Tuning allows for changes to the basic calibration data for **Idle**, **Spark**, **Fuel**, **Fuel Pump**, **System Setting**, and **System IO**. Advanced Tuning is a control function and 2D table that are less commonly used. These parameters require some understanding before changing.

The Main Menu has six options: **Monitor**, **Tuning**, **Logging**, **Files**, **Settings**, and **Wizards**.

Click the "🏠" icon in the upper right corner to return to the Home Screen.

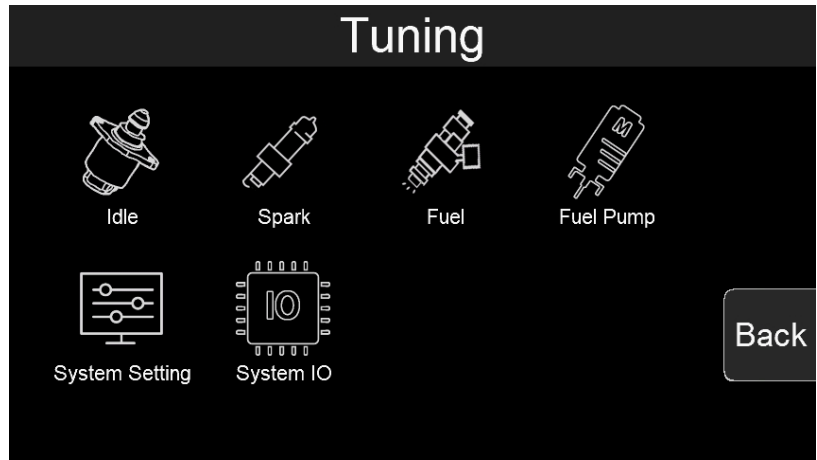


## 1 IDLE

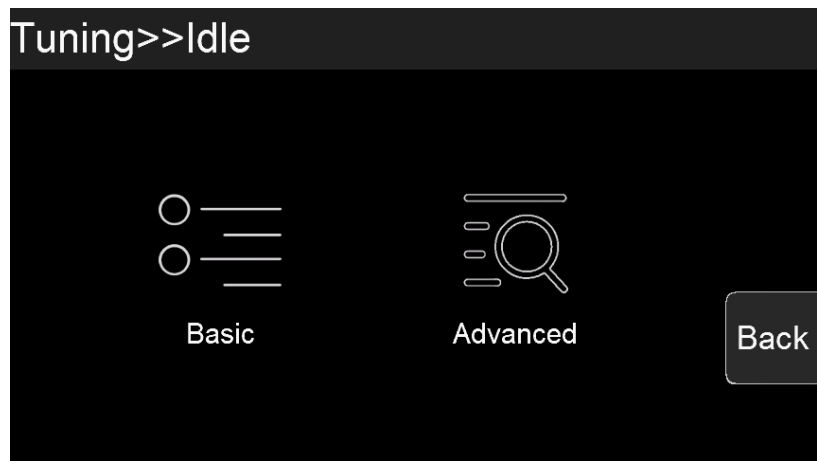
The goal of the operating system is to define the status of the engine related to its operating point. This status depends on engine speed and load. The following states are defined here: **engine stopped**, **startup**,

**idle, push, WOT, push fuel cutoff, and follow.** Follow is an engine operating state that helps your engine to get to idle smoothly.

Select Tuning and click the Idle icon to enter the Idle screen.

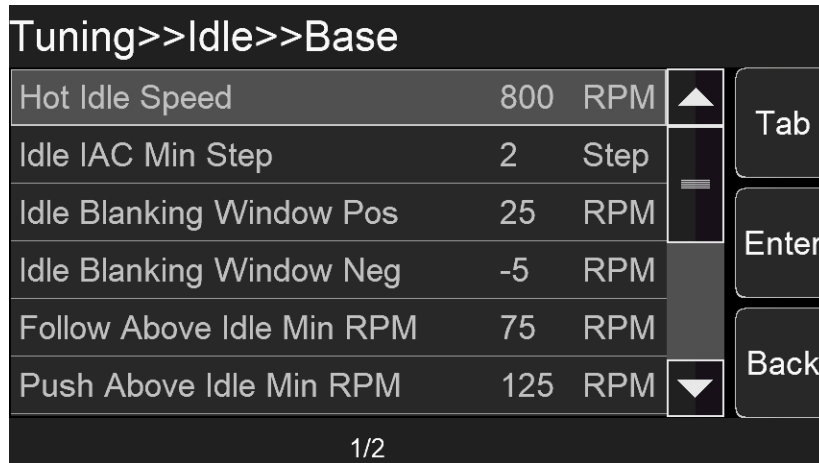


Tuning Screen



Idle Screen

## 1.1 Basic Idle Parameters



The screenshot shows a menu titled "Tuning>>Idle>>Base" with a list of parameters and their values. To the right of the list are three buttons: "Tab", "Enter", and "Back". At the bottom of the screen is a page indicator "1/2".

Parameter	Value	Unit
Hot Idle Speed	800	RPM
Idle IAC Min Step	2	Step
Idle Blanking Window Pos	25	RPM
Idle Blanking Window Neg	-5	RPM
Follow Above Idle Min RPM	75	RPM
Push Above Idle Min RPM	125	RPM

Basic Idle Screen

### Hot Idle Speed

This is the target RPM that is enabled at coolant temperatures above 160°F.

### Idle IAC Min Step

The minimum of IAC steps

### Idle Blanking Windows Pos

At engine idle state, when current idle speed is greater than the target idle speed, the difference between the current speed and target idle speed is less than this value, and the IAC closed-loop control is not performed. This parameter is a positive value.

### Idle Blanking Windows Neg

At engine idle state, when current idle speed is less than the target idle speed, the difference between the current speed and target idle speed is less than this value, and the IAC closed-loop control is not performed. This parameter is a negative value.

### Follow Above Idle Min RPM

Min threshold RPM to get into follow states

### Push Above Idle Min RPM

Min threshold RPM to get into push states

### Push Above Idle Max RPM

Max threshold RPM to get into push states

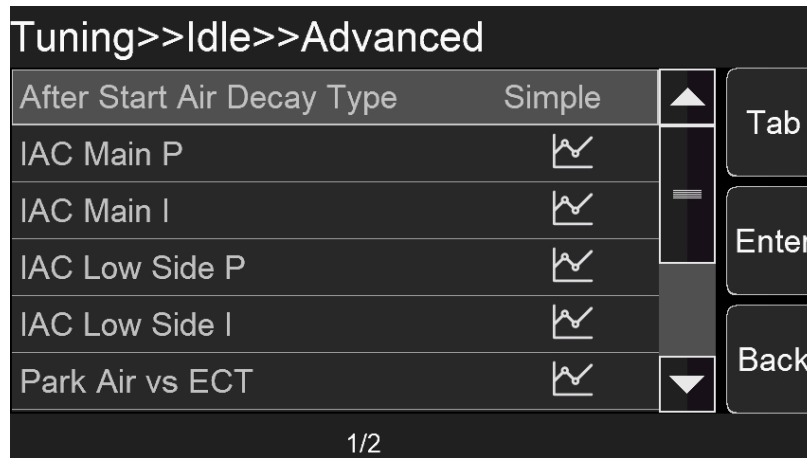
### Startup Air Fast Decay Cycle

After the engine is started, the starting air quickly decays to the target idle speed according to a certain period. The smaller the value, the faster the air decays.

### Startup Air Slow Decay Cycle

After the engine is started, the starting air quickly decays to the target idle speed in a certain period. When the actual speed is close to the target idle speed, the air decay speed should be slowed down. The larger the value, the slower the air decay.

## 1.2 Advanced Idle Parameters



Advanced Idle Screen

### After Start Air Decay Type

If you select this option, the speed of starting air attenuation is determined by the table, and the attenuation speed is determined by the ECT look-up table.

### IAC Main P

Current idle speed is higher than target idle speed, the setting of proportion.

### IAC Main I

Current idle speed is higher than target idle speed, the setting of integration.

### IAC Low Side P

Current idle speed is lower than target idle speed, the setting of proportion.

### IAC Low Side I

Current idle speed is lower than target idle speed, the setting of integration.

### Park Air vs ECT

This is the % position in which the IAC motor will be during cranking and immediately after the engine starts. If it is too high, the engine will be at too high of an RPM once it starts - too low and poor starting will result. Note that this is a temperature-based table. The percentage value changed in the handheld offsets this entire curve.



### Speed Raise Air

This is the % position of IAC for adjusting peak RPM after engine startup.

### Startup Air Fast Decay Cycle

Table for Startup Air decay rate to get to target idle speed.

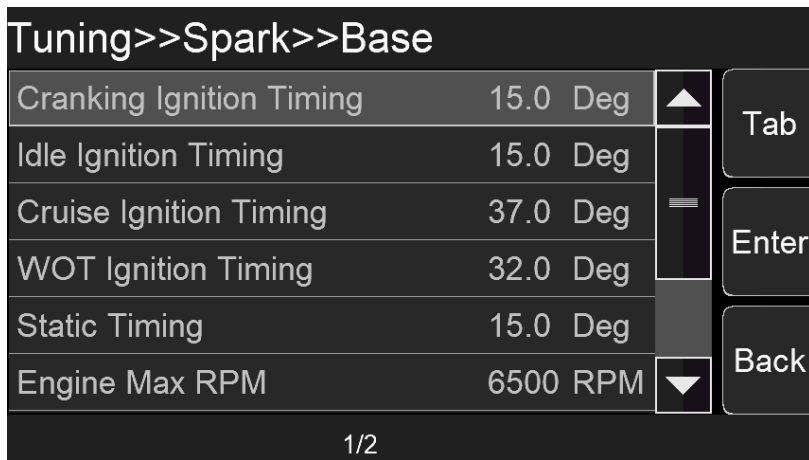
### Startup Air Slow Decay Cycle

Table for Startup Air decay rate to get to target idle speed.

## 2 SPARK

Go to the Tuning page of the Handheld and select the Spark icon.

### 2.1 Basic Spark Parameters



The screenshot shows a handheld device screen with the following content:

Tuning>>Spark>>Base		
Cranking Ignition Timing	15.0 Deg	▲
Idle Ignition Timing	15.0 Deg	■
Cruise Ignition Timing	37.0 Deg	≡
WOT Ignition Timing	32.0 Deg	■
Static Timing	15.0 Deg	■
Engine Max RPM	6500 RPM	▼

Navigation buttons on the right: Tab, Enter, Back.

Page indicator at the bottom: 1/2

Basic Spark Screen

#### Crank Ignition Timing

Crank ignition advance is normally set to 15 for most engines to help quick start.

#### Idle Ignition Timing

18-34 degrees is typically used at idle but depends on configuration, camshaft, and engine displacement, etc.

#### Cruise Ignition Timing

32-48 degrees is typically used when cruising for optimal fuel economy.

### **WOT Ignition Timing**

Older V8 engines are usually between 32-38 degrees.

### **Static Timing**

These parameters should be used when having the KILLSHOT EFI control the ignition timing to sync actual engine timing with commanded timing. Use the "static timing set" function and set the timing to a fixed value such as 15 degrees. Rev the engine up to about 3500 RPM (using appropriate caution/safety). Verify that the engine timing matches the Static Value setting at all RPMs. If it does not, the inductive delay will need to be changed in the Ignition Setup Screen until the timing of the engine matches the value set in the Static Timing Screen.

### **Timing Offset**

Use this value to retard or advance the timing or sync timing at higher RPMs. These values are set to 0 in the base calibrations. Some ignition modules may need this number altered if the commanded timing does not match the commanded timing as engine speed increases. If the timing starts to retard as rpm increases, this number can be increased in order for the timing to match.

### **Engine Max RPM**

Max RPM of engine; rev limiter is spark controlled.

### **Cut Ign & Fuel**

Cuts ignition and fuel when the Engine Max RPM is hit; means that ignition and fuel will be removed from individual cylinders as needed to limit RPM.

**Note:** The strategy of fuel and ignition cut is individual cylinder control. It gives your engine stable, smooth performance at Max RPM, Launch RPM, and Burn RPM statuses.

### **Ign Advance Min**

Min threshold of ignition advance

### **Ign Advance Max**

Max threshold of ignition advance

### **Coil Output Dwell**

The dwell time of the KILLSHOT ignition coil; KILLSHOT drives the ACES High Performance Ignition Coil (AC2008) which has 90mj spark energy with 3ms dwell time.

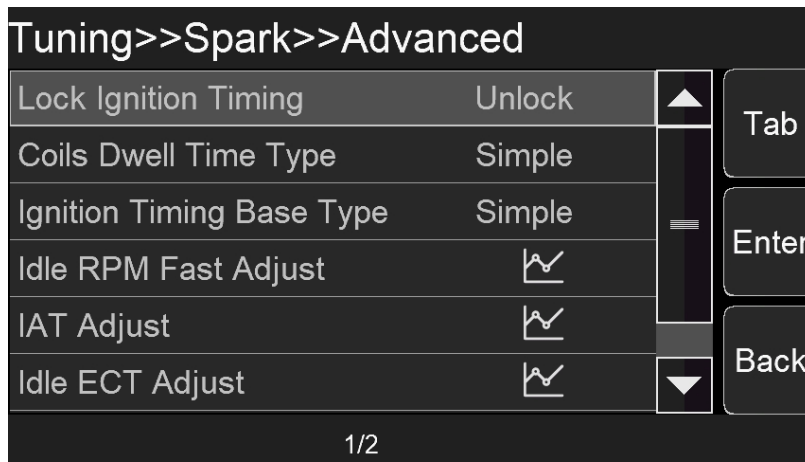
## **2.2 Advanced Spark Parameters**

### **Lock Ignition Timing**

This is a switch to lock or unlock ignition timing, verifying ignition timing by lock status to check ignition timing or distributor sync. When "Unlock" is selected, the KILLSHOT controls timing.

### **Coil Dwell Time Type**

Default setting is "Simple." This option is to select "Simple" or "table" for coil dwell time.



**Advanced Spark Screen**

**Ignition Timing Base Type**

Default setting is "Simple." This option is to select "Simple" or "2D" table of MBT Timing. Using the ACES PC Tuning software allows you to build a custom ignition timing curve.

**Idle RPM Fast Adjust**

The ECU modifies commanded timing at idle to help maintain the target idle speed. This graph is used to vary ignition timing to help regulate idle speed. The horizontal axis of the graph represents the difference between the actual idle speed and the target idle speed, and the vertical axis of the graph represents the number of degrees to alter the ignition timing. If the idle speed is too high, the ECU will retard the timing by the amount specified in the graph. If the idle speed is too low, the ECU will advance the timing by the amount specified in the graph. It is recommended to set this entire table to zero as a starting point. Add timing trim only if you are otherwise unable to achieve a smooth, stable idle.

**IAT Adjust**

The IAT Adjust table is used to trim the ignition timing vs. inlet air temperature and is often used on boosted applications as a safety mode because ignition timing is reduced at very high air temperature readings to avoid detonation. Note that the trim values in this table are added (positive values) or subtracted (negative values) from the base ignition timing.

**Idle ECT Adjust**

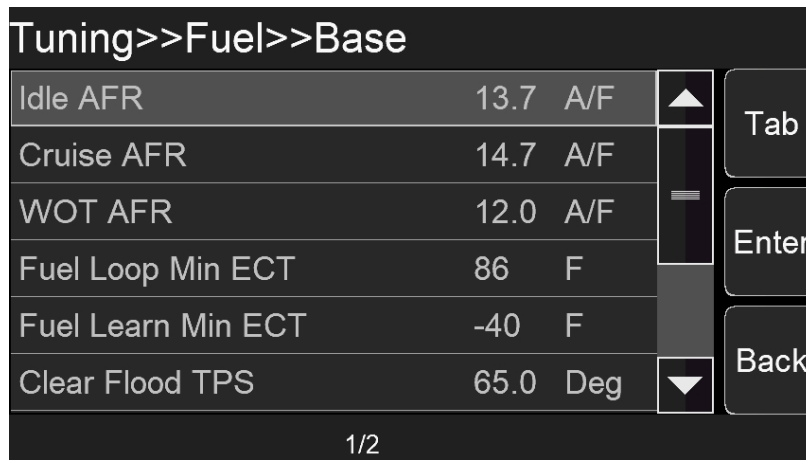
The Idle ECT Adjust is used to trim the ignition timing vs coolant temperature at idle. Sometimes used on N/A applications with very large camshafts to help with warmup. A few degrees of additional timing during warmup can help quite a bit. Note that the trim values in this table are added (positive values) or subtracted (negative values) from the base ignition timing.

**Ign Dwell Time**

Table of dwell time; time vs battery voltage

## 3 FUEL

### 3.1 Basic Fuel Parameters



Tuning>>Fuel>>Base		
Idle AFR	13.7	A/F
Cruise AFR	14.7	A/F
WOT AFR	12.0	A/F
Fuel Loop Min ECT	86	F
Fuel Learn Min ECT	-40	F
Clear Flood TPS	65.0	Deg

1/2

Basic Fuel Screen

#### Idle AFR

Target AFR of fuel control when the engine is at Idle, typically between 13.5 and 14.7. Engines with larger cams may need a richer setting for smoothest idle .

#### Cruise AFR

Target AFR of fuel control when the engine is at Cruise, typically between 13.5 and 14.7. Engines with larger cams may need a richer AFR.

#### WOT AFR

Target AFR of fuel control when the engine is at WOT, typically between 12.5 and 13.2 on Naturally Aspirated engines. Running richer may reduce power. Running leaner may reduce power or cause potential engine damage .

#### Fuel Loop Min ECT

Minimum of engine coolant temperature enable **Fuel Loop**. Fuel loop will be active above this setting.

#### Fuel Learn Min ECT

Minimum of engine coolant temperature enable **Fuel Learn**. Fuel Learn will be active above this setting.

#### Clear Flood TPS

If the TPS value is at 65 or higher during cranking, the ECU will operate in **Clear Flood** mode, meaning that it will trigger the ignition but will not fire the injectors.

#### Fuel Power On Percent

This value is multiplying Crank fuel PW of first column of Crank Fuel table when ignition Key on.

**Fuel Prime Percent**

This value is multiplying fuel PW of first column of Crank Fuel table, it only fires one time once ECU gets RPM signal. It will help wet intake and valve, make crank to run easier.

**Rated Injector Pressure**

This value is injector working pressure, fuel pressure of ACES fuel injector is 43PSI.

**After Start Decay Cycle**

After engine startup, engine RPM will get to idle from peak RPM, during this period start air will decay out, smaller number of decay cycle will decay fast, engine goes to idle more fast.

**After Start Decay Rate**

After engine startup, engine RPM will get to idle from peak RPM, during this period start air will decay out, bigger number of decay rate will decay fast, engine goes to idle more fast.

**Fuel Learn Rate**

The fuel learn can be set to quickly or slowly learn the fuel trim adjustments.

**Fuel Learn Cycle**

The timer of fuel learn, short timer will learn quickly.

**Fuel Learn Read Coef**

The coefficient of reading fuel learn data from fuel learn table.

**Fuel Learn Min Limit**

This value limits how much the fuel learn can learn downwards.

**Fuel Learn Max Limit**

This value limits how much the fuel learn can learn upwards.

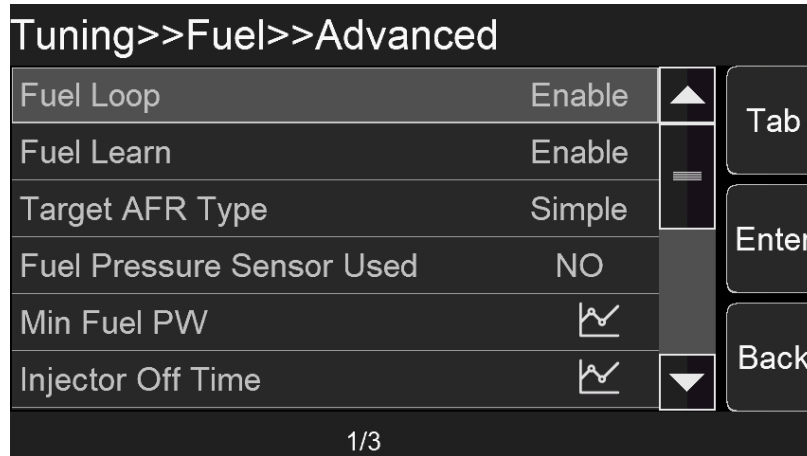
**Loop Max Limit**

This limits how much extra fuel can be added by the fuel loop.

**Loop Min Limit**

This limits how much fuel can be removed by the fuel loop.

## 3.2 Advanced Fuel Parameters



Advanced Fuel Screen

### Fuel Loop

This option is to enable or disable fuel loop control default setting is Enable fuel loop control. There is typically no reason to turn off closed loop operation unless you suspect an oxygen sensor problem and want to disable the sensor.

### Fuel Learn

This option is to enable or disable fuel learn control, default setting is Enable fuel learn control. If enabled, self-tuning is performed. Learning should be enabled when an engine is first run with the Jackpot and the tuning process is occurring.

### Target AFR type

The Simple option is a value at different engine state, The Target AFR Table is a 2D table used for setting target air/fuel ratios throughout the operating range of the engine.

### Fuel Pressure Sensor Used

Fuel pressure sensor default setting is NO in KILLSHOT EFI system. KILLSHOT EFI system fuel pressure setting is 3 bar or 45 psi.

### Min Fuel PW

Injector close time.

### Injector Off Time

Injector opening time vs different battery voltage.

### MAT Fuel Enrichment

The **Manifold Air Temp Enrichment** table is used to compensate for air density changes with inlet air temperature. It can also be used in a safety mode to add additional cooling fuel at very high inlet air temperatures on boosted applications.

### **After Start Decay Rate**

This table is displayed as a 2D graph of the rate at which the after start enrichment will decay out based on engine temperature. The decay rate is shown as the number of crank pulses that must be received by the ECU to reduce the after start enrichment. The higher you set these values, the longer it would take for the after start fuel to decay out once it was applied.

### **Acceleration Enrichment vs TPS**

Adds additional, momentary fuel based on the rate of change of the TPS. Same function as an accelerator pump on a carburetor.

### **TPS Acceleration Enrichment vs ECT**

Displays a 2D graph of acceleration enrichment fuel applied in ECT change. This 2D graph is increasing or decreasing the 3D table of TPS base film which is activated to running at engine state of acceleration and deceleration.

### **MAP Acceleration Enrichment vs ECT**

Displays a 2D graph of acceleration enrichment fuel applied in ECT change. This 2D graph is increasing or decreasing the 3D table of MAP base film which is activated to running at engine state of acceleration and deceleration.

### **TPS Acceleration Decay Rate**

Displays a 2D graph of TPS acceleration enrichment fuel decay rate applied in ECT change.

### **MAP Acceleration Decay Rate**

Displays a 2D graph of MAP acceleration enrichment fuel decay rate applied in ECT change.

## **4 Fuel Pump**

### **Turn Off RPM**

Engine RPM lower than setting numbers, fuel pump will turn off.

### **Key On Pump Hold Time**

When Key on without engine crank, how long time fuel pump will be power on.

### **Turn Off After Lose RPM**

When ECU lose crank signal, how long time ECU turn off fuel pump.

## 5 System Setting

### 5.1 Basic System setting

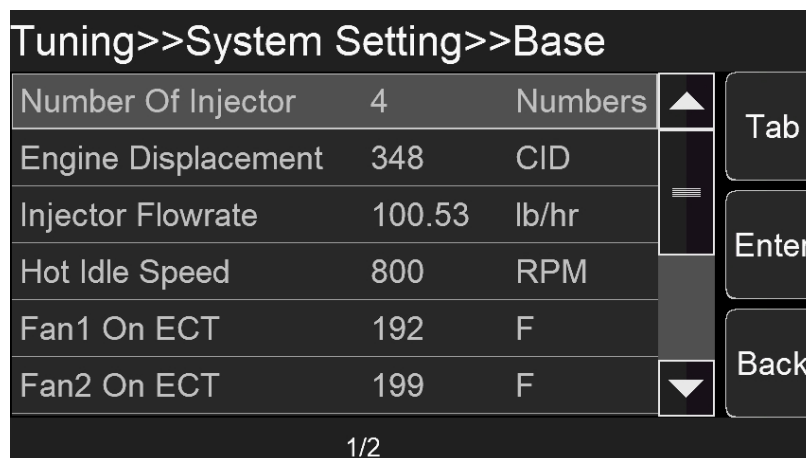
#### Number Of Injector

This parameter is a part of the ECU calculation to determine the amount of fuel to inject. Enter the number of cylinders the engine has. This must be entered correctly, or the engine will not run correctly, if at all in some cases.

For the KILLSHOT is 4 injectors.

#### Engine Displacement

This parameter is a part of the ECU calculation to determine the amount of fuel to inject when running . Enter the engines displacement in cubic inches. This must be entered correctly, or the engine will run richer or leaner than intended.



Basic System Setting Screen

#### Injector Flowrate

This parameter is a part of the ECU's calculation to determine the amount of fuel to inject when running . It is also used for fuel flow and mileage calculations. Enter the flow rate of the injectors in lb./hr. This must be entered correctly, or the engine will run richer or leaner than intended. Keep in mind that fuel pressure affects flow rate. When manufacturers rate injectors, it is at a certain fuel pressure. Injectors from ACES are rated at 45 psi.



### Hot Idle Speed

Set idle speed of warm engine.

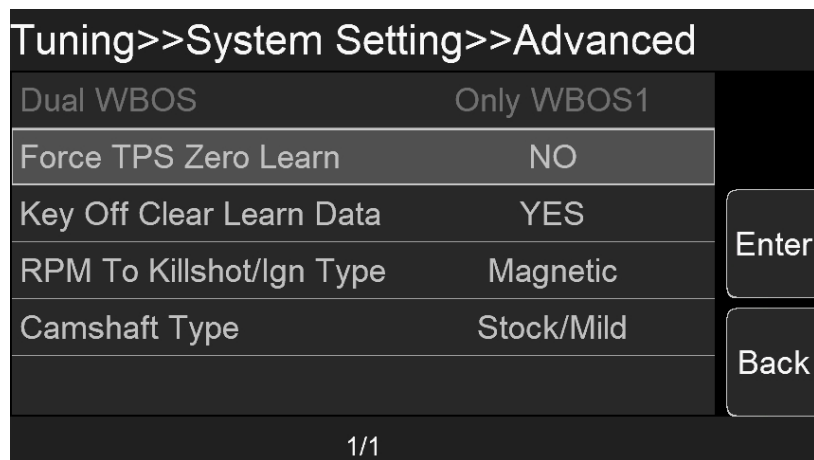
### TPS Closed Threshold

This number is the threshold of TPS closed.

### TPS Closed Hysteresis

This number is the hysteresis during TPS closed, bigger than Closed threshold.

## 5.2 Advanced System setting



Advanced System Setting Screen

### Dual WBOS

Select Only WBOS1 for your KILLSHOT EFI system

### Force TPS Zero Learn

Throttle zero position is auto-learn strategy in Jackpot ECU, choose yes to do TPS Zero Learn again.

### Key Off Clear Learn Data

Choose YES, then turn the ignition key off, wait 5 seconds, then turn the key on, all the Learn data (fuel learn table, IAC learn steps, ETC learn steps etc.) will be clear up.

### RPM To KILLSHOT / Ignition Type

Select your ignition type:

Coil (-) [no timing control]

**CD Ignition Box** [no timing control]

**Magnetic** [ECU Controlled Timing]

**Camshaft Type**

Select your camshaft type:

**Stock/Mild** = This selection will work well on most applications equipped with stock or “street performance” camshafts. Choose **Stock/Mild** if you are unsure of your camshaft specs.

**Street/Strip** = Select this if your engine has between 8” and 13” of manifold vacuum.

## 6 System IO

**Fan1 On ECT - 195°F**

**Fan2 On ECT - 205°F**

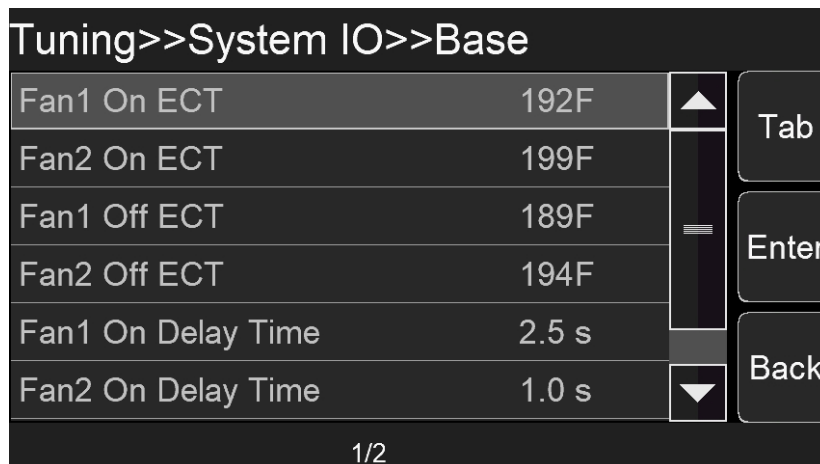
**Fan1 Off ECT - 180°F**

**Fan2 Off ECT - 190°F**

**Fan1 On Delay Time**

**Fan2 On Delay Time**

The ECU has an output to operate a cooling fan. This output switches to ground and is wired to the negative terminal of a relay to activate the fan. This parameter defines the coolant temperature that must be exceeded to activate the fan. It needs to be set higher than **Fan Off Temperature** (\*F).



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